FINAL-SPEC ENTERPRISE TEST

YOUR COMPUTER

Canada	C$	4.00	
Denmark	DKr.	35.00	
France	Fr.	50.00	
Germany	DM	9.50	
Greece	Dra.	290.00	
Holland	DFl.	8.50	
Italy	L	4200	
New Zealand	NZ$	3.70	
Singapore	M$	6.25	
Spain	Pts.	390.00	
Switzerland	SFr.	7.00	
U.S.A.	$	3.95	(D72163)

90p

FEBRUARY 1985 BRITAIN'S BIGGEST SELLING HOME COMPUTER MAGAZINE Vol.5 No.2

WHATEVER NEXT FROM THE ARCADES?

Spectrum Spraymania and Synsounds

CBM-64 Mars Buggy and Composer

Animating Amstrad and Death Race

Vic Gunfight and Oric Hero Zero

BBC Superfile and Hold-Up

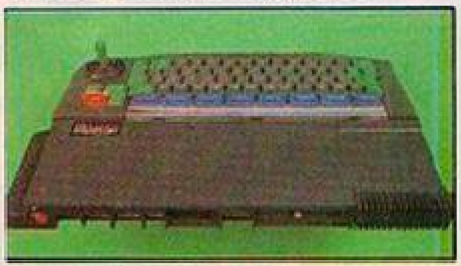
WIN SINCLAIR'S NEW MICRO... WHEELS 'N ALL

AUTOMAN
BUG-BYTE
Commodore 64
Officially Licensed from
20th Century Fox
Mulberry House, Canning Place, Liverpool L1 8JB Tel: 051-709 7071

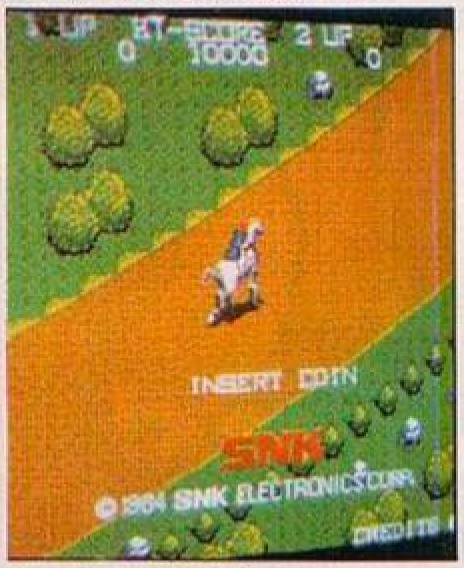
YOUR COMPUTER Contents

FEBRUARY 1985

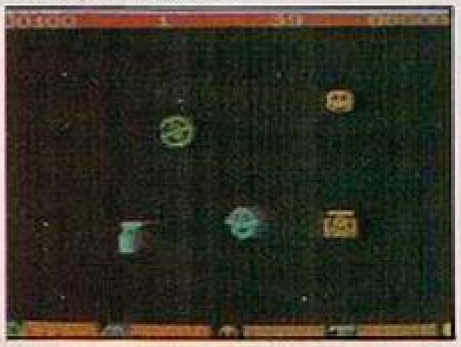
Software shortlist: page 35.



Enterprise review: page 46.

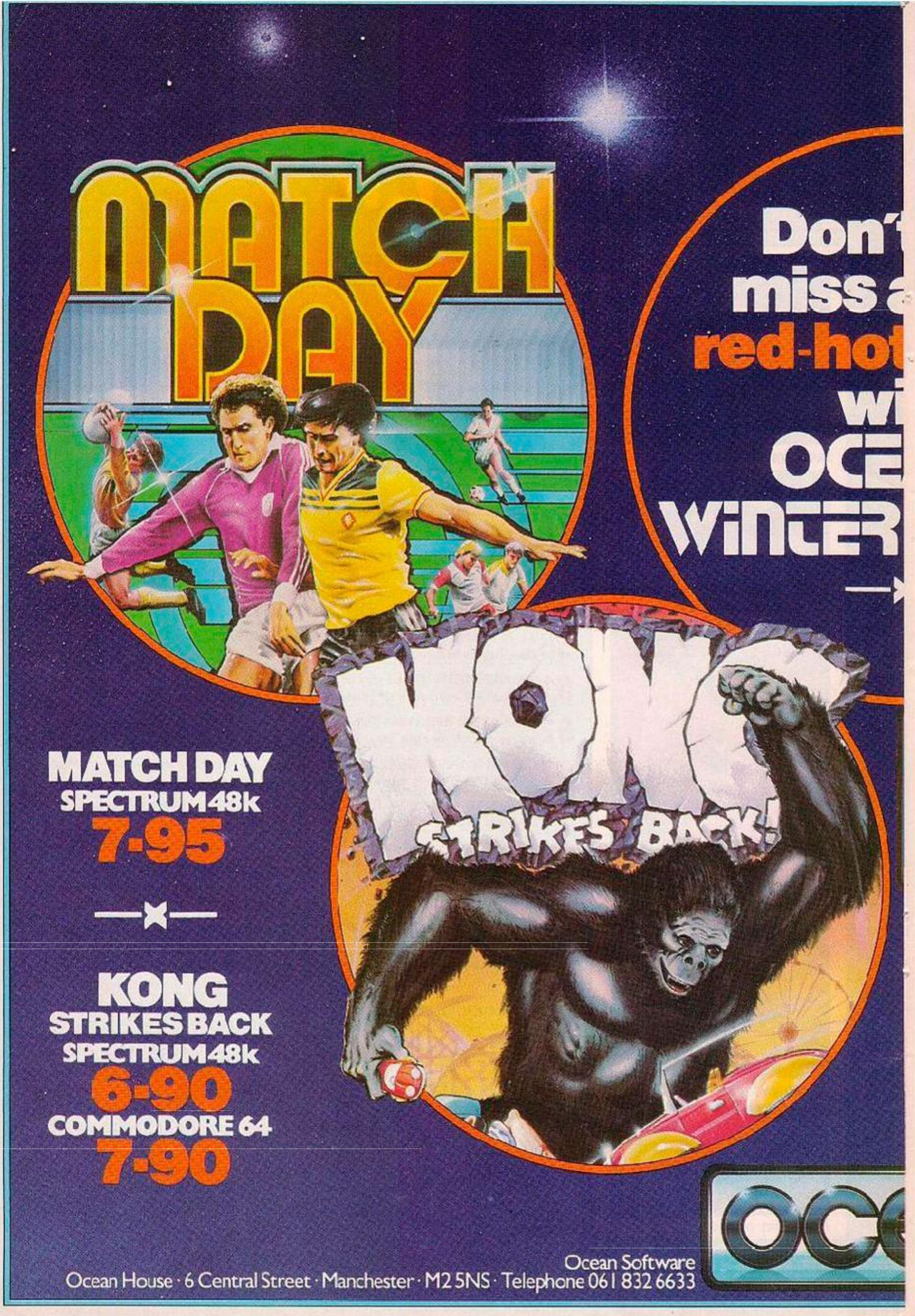


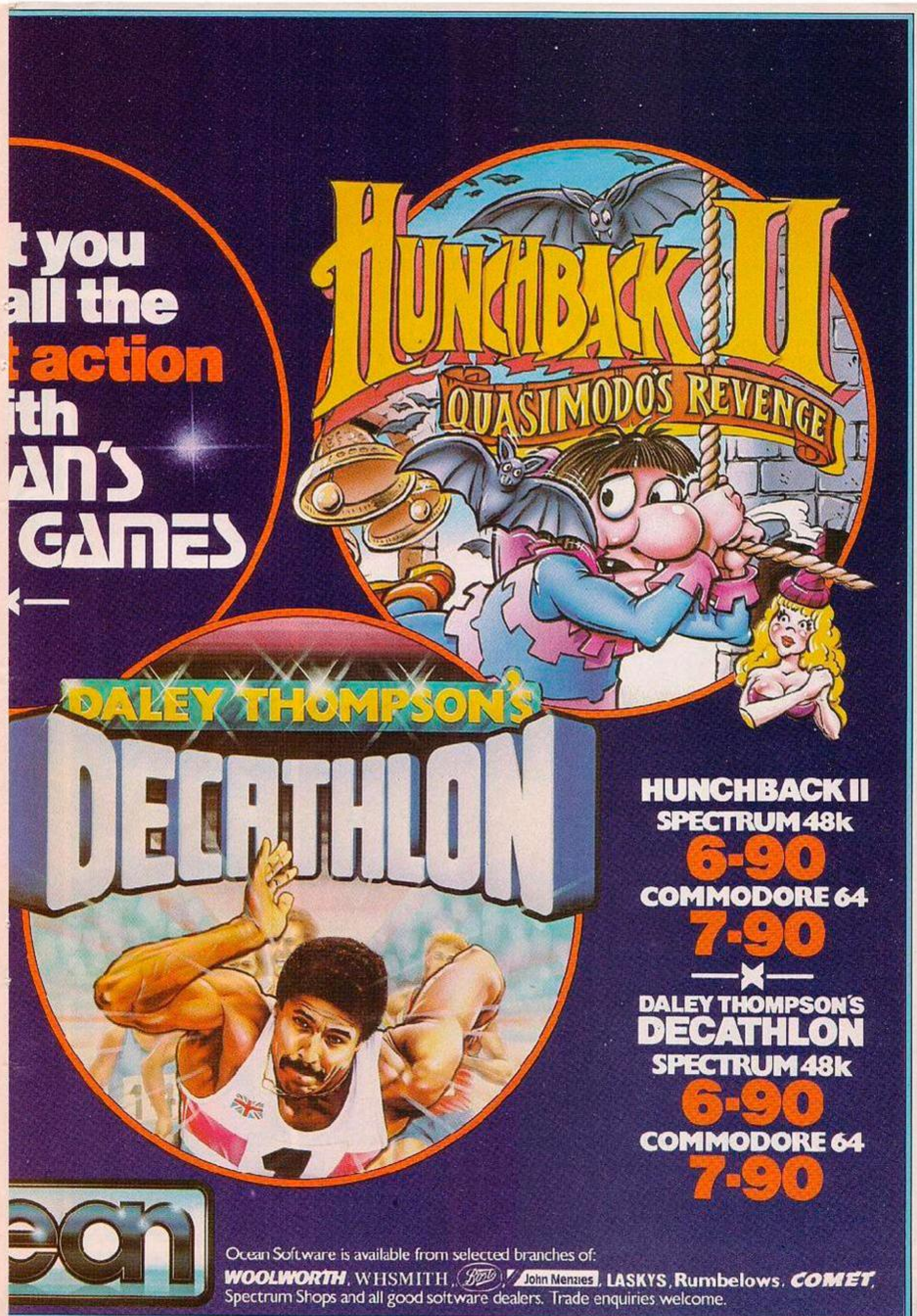
Arcades: page 54.



Spraymania: page 62.

Hero Zero: page 81.


MATCH DAY
KONG STRIKES BACK!
MATCH DAY
SPECTRUM 48k
7·95
KONG
STRIKES BACK
SPECTRUM 48k
6·90
COMMODORE 64
7·90
Ocean Software
Ocean House · 6 Central Street · Manchester · M2 5NS · Telephone 061 832 6633



t you
all the
t action
ith
an's
games
HUNCHBACK II
QUASIMODO'S REVENGE
DALEY THOMPSON'S
DECATHLON
HUNCHBACK II
SPECTRUM 48k
6·90
COMMODORE 64
7·90
DALEY THOMPSON'S
DECATHLON
SPECTRUM 48k
6·90
COMMODORE 64
7·90
ean
Ocean Software is available from selected branches of:
WOOLWORTH, WHSMITH, Boots, John Menzies, LASKYS, Rumbelows, COMET,
Spectrum Shops and all good software dealers. Trade enquiries welcome.

REWRITE HISTORY THIS WEEKEND!

All action strategy games from SSI- -the world's No.1 war game company

64 ATARI

Spectrum versions available soon!

At last here is your chance to see how you shape up as a General in a real battle! The pages of history record the triumphs and failures as Eisenhower, Montgomery, Rommel and Von Rundstedt battled in Europe and North Africa. But with a clear thinking strategist like yourself in command perhaps the historians would have had a different story to write!

U.S. Gold is proud to present four of the best strategy games by Strategic Simulations Incorporated:

KNIGHTS OF THE DESERT pitches the British Forces of Montgomery against the might of Rommel and his Panzer Divisions in the classic North African campaign of 1941.

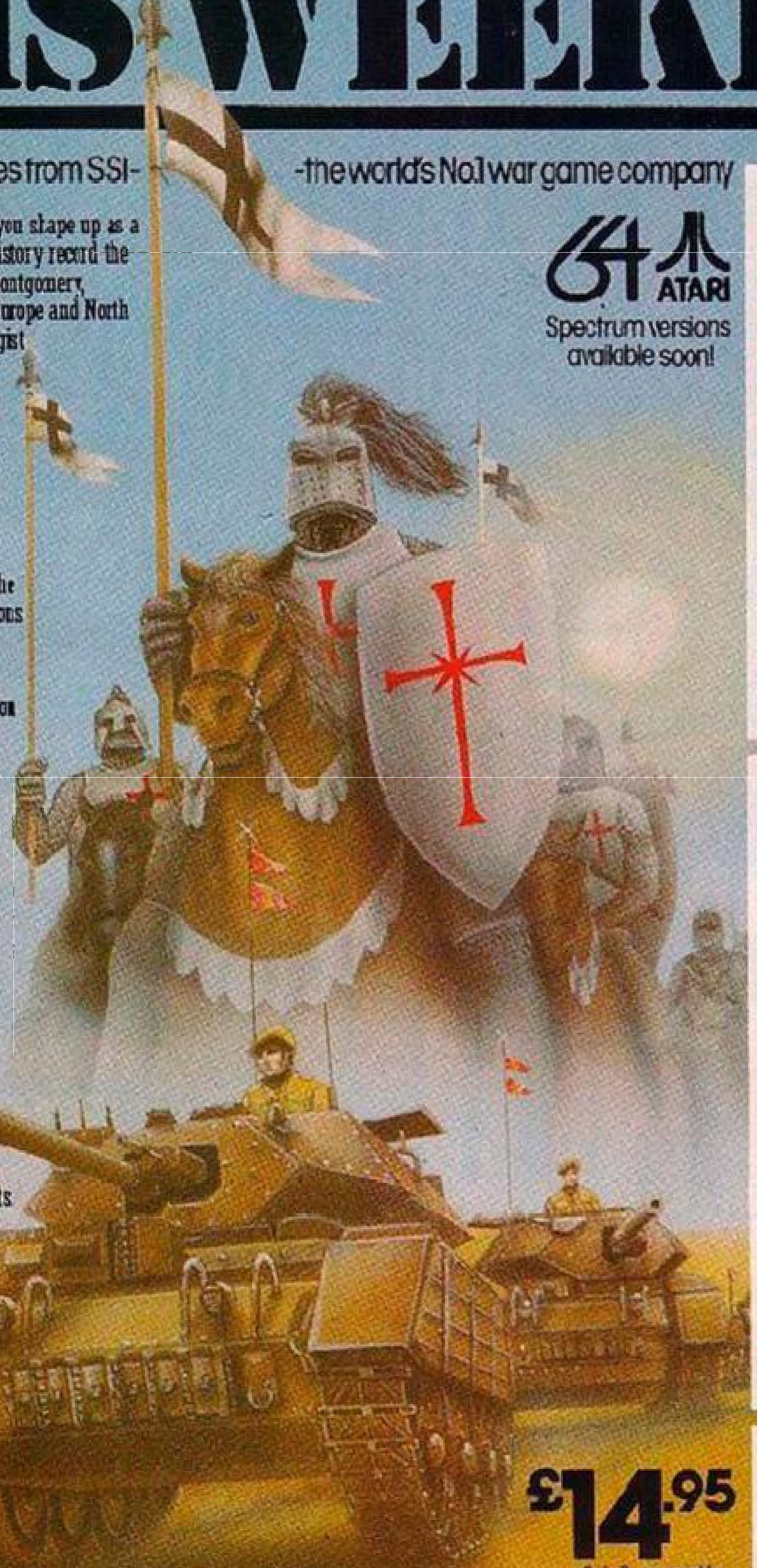
BATTLE FOR NORMANDY commences on 'D-Day' June 6th 1944 and relives the Allied Forces attempt to smash Hitler's Atlantic Wall.

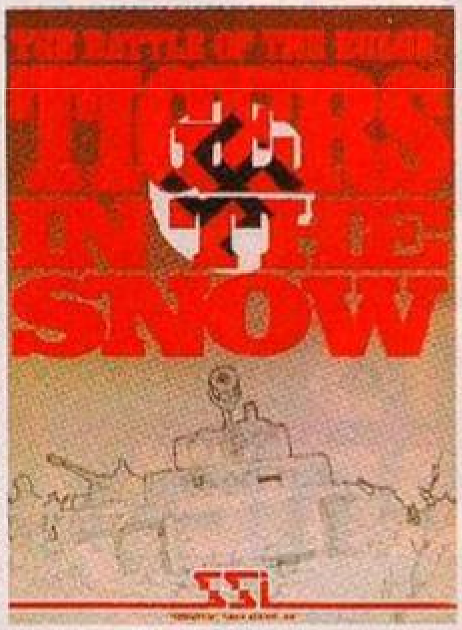
TIGERS IN THE SNOW reconstructs the legendary Battle of the Bulge as in December 1944 the Panzer Divisions of Von Rundstedt try one last gamble in a desperate attempt to halt Eisenhower's advancing Allied lines.

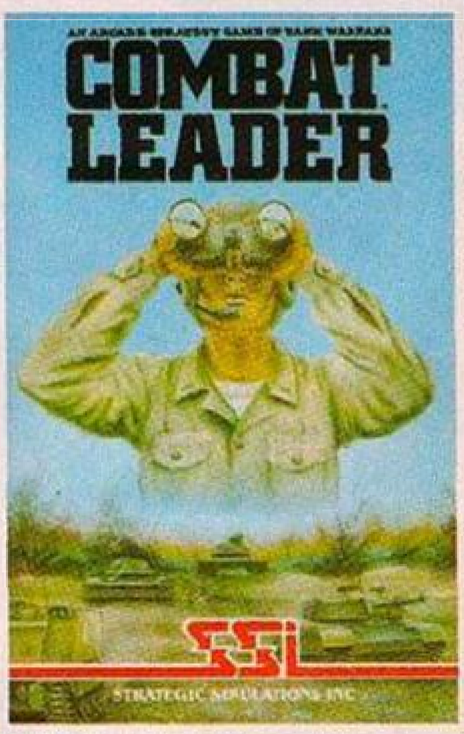
Who will be the victor and who the vanquished?

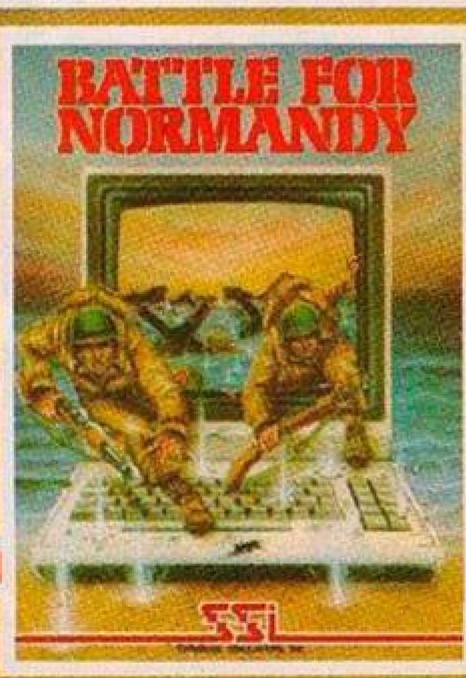
Only you have the answers!

And if you're looking for strategy with arcade action then COMBAT LEADER will test all your wits depth of thought and reflexes in this toughest of battle challenges!









£14.95 disk & cassette

THE ULTIMATE IN AMERICAN SOFTWARE FOR YOU ON U.S. GOLD

U.S. Gold is stocked by all leading computer stores including:

BOOTS WHSMITH JOHN MENZIES WILDINGS WOOLWORTH

DEALERS! For information on how to become a U.S. Gold Stockist write to: CentreSoft Ltd., Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Telephone: 021 359 3020.

U.S. GOLD All American Software

SSI STRATEGIC SIMULATIONS INC.

A fantastic fight to the death within your own bloodstream...
Blood'n'Guts
...Through the miracle of Dr Hackers REDUCTO-RAY you find yourself inside the body of a very sick hypochondriac Your only escape is to reassemble your submarine which has broken into eight pieces and distributed itself around the body. Not for the weak at heart!
MICRO-SURGERY FROM
QUICKSILVA
on the 48K Spectrum
£6.95
Quicksilva Mail Order, P.O. Box 6, Wimborne, Dorset BA21 7PY.
Telephone (0202) 891744.
Access
BARCLAYCARD VISA
Selected titles available at:
WHSMITH
Boots
WOOLWORTH
John Menzies
and leading multiple retailers and specialist computer stores

Even in today's high tech world, for most of us, the written word is still the least expensive means of sending and receiving information. If you own a microcomputer the chances are that sooner or later later you are probably going to need a printer.

Micro P – CPP40

A low cost 4 colour 40/80 column printer/plotter capable of printing text or graphics on plain paper. The CCP40 is an ideal companion for small and portable micro's, as it is fitted with re-chargeable batteries – perfect for beginners.

Micro P – SHINWA CPA80

With 100 cps quality printing, the CPA80 probably gives more cps/£ than any other printer available today. The CPA80 is packed with features you would normally find on a more expensive printer. With an optional RS232 version available (even for the QL) this Epson compatible printer will hook up to a most any micro.

See them at your local dealer today!

Micro P – MP165

Looking for a matrix printer as well as a daisywheel? Well, the MP165 combines all the attributes of these two technologies to give a matrix printer capable of printing at up to 165 cps, as well as providing crisp Near Letter Quality, (NLQ) print at 75 cps. Features include a 2k buffer as well as both friction and tractor feed, as standard. Ideally suited to most popular micro's, the MP165 is now available in a new RS232 QL compatible version.

Micro Peripherals Ltd

'THE POWER BEHIND THE PRINTED WORD'

INTEC UNIT 3, HASSOCKS WOOD, WADE ROAD, BASINGSTOKE, HANTS. ENGLAND, RG24 0NE.
Telephone BASINGSTOKE (0256) 473232 (32 lines).
Telex: 859669 MICROP G Facsimile: 0256 461570

*Full 12 months warranty - RRP ex. VAT. QL is a registered Trade Mark of Sinclair Research.

AMSTRAD BBC CBM64 SPECTRUM MEMOTECH NASCOM ATARI

"You really can't go wrong with any Level 9 game as they are all brilliant." *Crash Micro Sept 84*

RETURN TO EDEN

Level 9's first amazing full-colour graphical adventure.

Return to Eden is the long-awaited sequel to Level 9's top-selling Snowball adventure, set on the weirdest planet ever. Now it's here with 240 locations, masses of puns and puzzles and with hundreds of pictures in the AMSTRAD, CBM 64 and Spectrum versions.

"Whichever machine you own, if you have the vaguest tendency towards adventure playing then you must try one of these games (unfortunately you'll probably end up wanting to buy the lot."
– Computing Today, Aug 84

"The Level 9 Adventures are superbly designed and programmed, the content first rate. The implementation of Colossal Cave (Adventure) is nothing short of brilliant; rush out and buy it. While you're at it, buy their others, too. Simply smashing!"
– Your 64, June 84

"Level 9 – arguably the producers of the best adventure games in the UK – have done it again. Lords of Time is a sparkling addition to its stable of winners."
– Acorn User, July 84

"One of the best adventure games I have ever had the pleasure to get my hands on. I can recommend Dungeon Adventure without the slightest fear of being contradicted. This is a massive sojourn into the unknown."
– Memopad, Oct 84

"The Saga of Erik the Viking . . . a remarkable Adventure game. It carries all the hallmarks of a Level 9 Adventure – problem, text display and size of map – with graphics of a standard I have not yet seen before in an Adventure."
– Computer & Video Games, Oct 84

"I thoroughly recommend these Adventures, they are excellent value for money. No self-respecting Adventure-addict should be without them. I believe Level 9 are producing a series of Adventures which should be regarded as classics."
– Page 6, July 84

Available from the HMV Shop and good computer stores everywhere. If your local dealer doesn't stock Level 9 adventures yet, use the coupon to buy them from us, or ask him to contact: Centresoft, Microdealer UK, Lightning, Leisuresoft, R&R, Lime Tree, PCS (SW), MCD, Wonderbridge etc.

	Cassette £9.95	Disk £11.95 BBC/CBM64
COLOSSAL ADVENTURE: The classic mainframe game, with 70 bonus rooms.	☐	☐
ADVENTURE QUEST: An epic puzzle journey through Middle Earth.	☐	☐
DUNGEON ADVENTURE: 40 treasures to find and 100+ puzzles to solve.	☐	☐
SNOWBALL: Immense Science Fiction game with over 7000 locations.	☐	☐
RETURN TO EDEN: Vegetarian adventure. (Amstrad, CBM 64 and Spectrum versions have 240 pictures)	☐	☐
LORDS OF TIME: Imaginative romp through World History.	☐	☐
ERIK THE VIKING: Family game for BBC CBM 64 and Spectrum only. All with 180+ pictures	☐	

I ENCLOSE A CHEQUE/PO FOR £9.95 PER CASSETTE OR £11.35 PER DISK

My name: ____________________

My address: ____________________

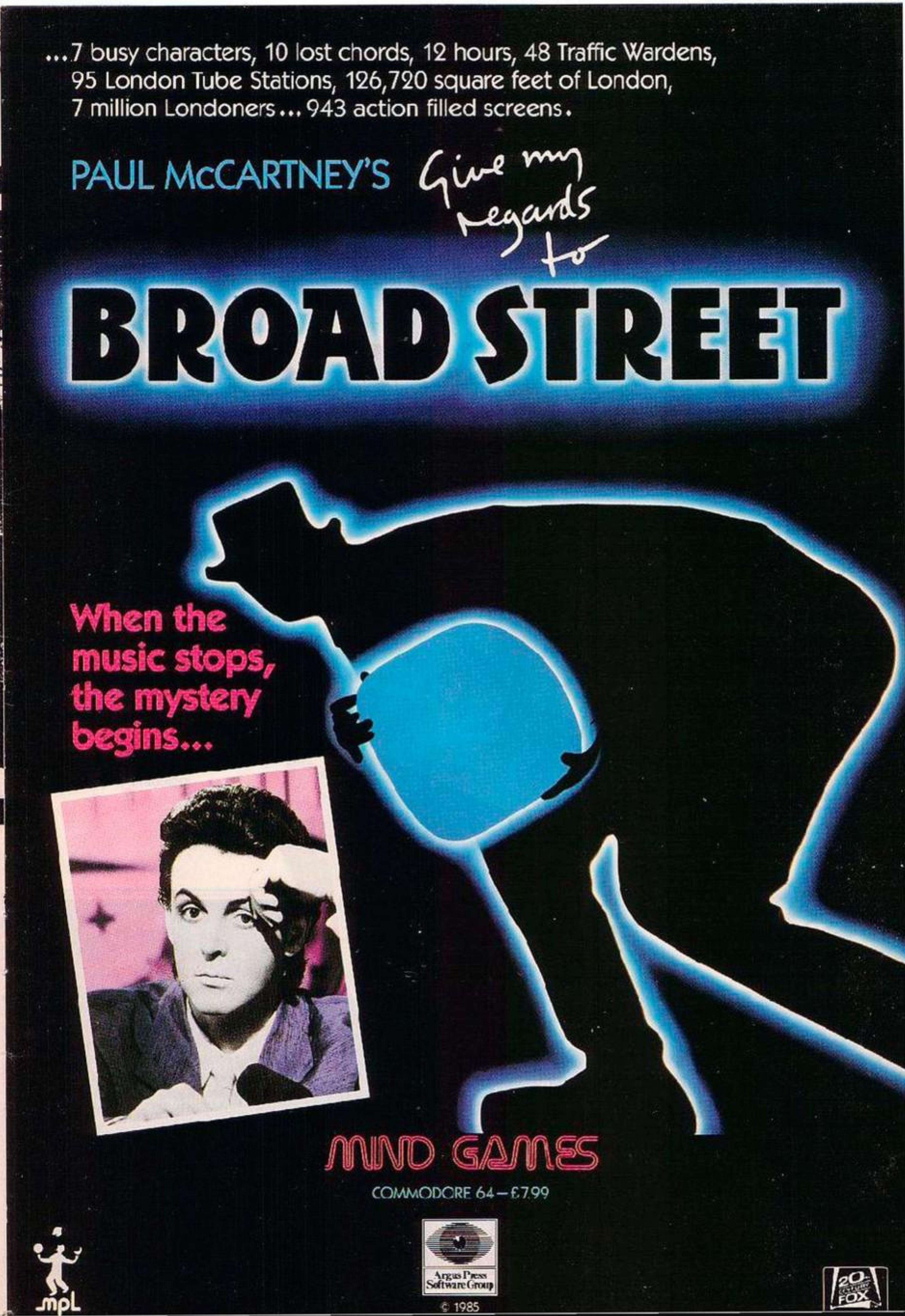
____

____

My micro is ____________________
(one of those listed below with at least 32K). Send coupon to:

LEVEL 9 COMPUTING
Dept Y, 229 Hughenden Road
High Wycombe, Bucks. HP13 5PG

AMSTRAD BBC CBM64 SPECTRUM MEMOTECH NASCOM ATARI


...7 busy characters, 10 lost chords, 12 hours, 48 Traffic Wardens, 95 London Tube Stations, 126,720 square feet of London, 7 million Londoners... 943 action filled screens.
PAUL McCARTNEY'S Give my regards to
BROAD STREET
When the music stops, the mystery begins...
MIND GAMES
COMMODORE 64 – £7.99
Argus Press Software Group
© 1985

TAKE A TEST FROM THE RANGE

BE SAFE NOT SORRY

Cumana's CS range of single disk drives have been subjected to the strict safety demands of the BEAB.
They have now been awarded BS415 approval, so if you value safety do not trust it to anything less than Cumana.
Cumana's dual range of disk drives have also been submitted for approval.

So now you have got your home computer, you're ready to talk to Cumana – the best name in memory. Already a market leader throughout Europe for their range of disc drives, Cumana now have other products on offer, all to the same exacting standards that have made their disc drives the number one choice in the home and in education.

The Touch Pad

The Touch Pad is a low-cost graphic plotting aid for the BBC micro. This compact display cursor moving device simplifies programming with the touch of the stylus.

The product comes complete with an instruction booklet, basic software, stylus and connecting cable. Its uses are in graphics, computer aided design, education and games.

£69.95
including VAT.

Disc Drives

Cumana have spent years on research, development and marketing a range of drives second to none. Their drives are compatible with BBC, Spectrum, Dragon, Oric, Tandy Models I, III and 4 and Video Genie. They are fully guaranteed for 12 months and approved for electrical safety by the D.M.E.E. and are extensively used in GLC and ILEA establishments. Cumana were the first independent disc drive supplier and are now Europe's market leader. Their products have been proven in the schools, universities and homes throughout Europe. Let us drive you in the right direction, send now for further details of the Cumana range, or see them at our distributors and at selected branches of W.H. Smith, Lasky's, Greens, Currys, and Spectrum UK.

DRIVE CUMANA

The Acorn Electron Computer

A microcomputer with a proven track record. Using BBC Basic, the Electron was developed out of the Micro that has been chosen for over 80% of schools participating in the Government's current Micros In Schools project. It connects into almost any TV set and cassette player and is supplied with a comprehensive User Guide which runs through, in a simple to follow manner, the basic principles of programming. A wide range of software is available, including games, educational packages and home accounts.

Cumana price
£199.00

Disk interface now available for the Acorn Electron, details from Cumana.

Diskettes

Only when Cumana found a double density diskette up to their stringent quality control requirements, and at a price that made sense to the end user, were Cumana ready to put their name to it.

The result was a top quality diskette, complete with a plastic protective case for the ten-pack (they are also sold in two-packs!) together with index stickers.

Cumana diskettes are available now in both 5¼ inch and 3½ inch as single or double-sided, 40 or 80 track, from your local computer dealer. Don't trust it to chance, go for the best name on record.

Cumana BBC Microcomputer compatible disk drives: retail price list.

Cumana disk drives supplied with formatting diskette, drive connecting cable and Cumana user guide. Independent power supply, mains lead and moulded plug included.

CS100 40 Track single sided (100K)	£159.95
CS200D 40 Track double sided (200K)	£203.95
CS200 80 Track single sided (200K)	£192.95
CS400 80 Track double sided (400K)	£219.95
CD200 2 x 40 Track single sided (200K)	£284.95
CD400D 2 x 40 Track double sided (400K)	£381.95
CD400/S 2 x 80 Track single sided (400K)	£359.95
CD800/S 2 x 80 Track double sided (800K)	£414.95

Cumana disk drives with independent power supply, mains lead and plug. Excluding other accessories.

CS100E 40 Track single sided (100K)	£149.95
CS200ED 40 Track double sided (200K)	£192.95
CS200E 80 Track single sided (200K)	£180.95
CS400E 80 Track double sided (400K)	£208.95

Cumana disk drives supplied with formatting diskette and Cumana user guide. Power supply taken from BBC Microcomputer, with lead supplied.

CSX100D 40 Track single sided (100K)	£119.95
CSX200D 40 Track double sided (200K)	£165.95
CSX200 80 Track single sided (200K)	£159.95
CSX400 80 Track Double sided (400K)	£189.95
3½ INCH DRIVES	
CSX351 40 Track single sided (100K)	£139.95
CSX354 80 Track double sided (400K)	£199.95
CDX352 2 x 40 Track single sided (200K)	£256.95
CDX358 2 x 80 Double sided (800K)	£383.95

The 'X' range takes its power from your microcomputer.

CS351 40 Track single sided (100K)	£169.95
CS354 80 Track double sided (400K)	£229.95
CD352 Dual 40 Track single sided (200K)	£299.95
CD358 Dual 80 Track double sided (800K)	£429.95

The 'CS' range comes complete with power supply.

DISTRIBUTORS/RETAIL

Available from the following retail outlets: W.H. Smith, John Lewis Partnership, Greens Leisure, Laskys, Spectrum UK.

Area distributors:
Addons Ltd. (Southampton) 0703 34775/6, Audio & Computer Centre (Jersey) 0534-74000, Eltec (Bradford) 0274-722512, South Wales Peripherals 0633-841760, HCCS Associates (Gateshead) 0632-621924, Hugh Symons (Bournemouth) 0202-26535, J. S. Simnett Computers (South London) 01-541 1495, Kingdom Design (Belfast) 0232-643720, Lightning (Harrow) 01-969 5255, Microage Distribution (North London) 01-205 7688, Microworld (Edinburgh) 031-228 1111, National Micro Centre (Stockport) 061-429 8080, Silicone Express (Leicestershire) 0533 371917, Thompson Cook (Birmingham) 021-328 3895.
+ National Dealer Network

CUMANA®

Cumana Limited, Pines Trading Estate, Broad Street, Guildford, Surrey. GU3 3BH
Telephone: 0483 503121

All Prices Inclusive of VAT.
All 80 Track 5¼" Drives are Switchable to 40 Track Mode

Ask an expert why the Electron's the best micro in its class.

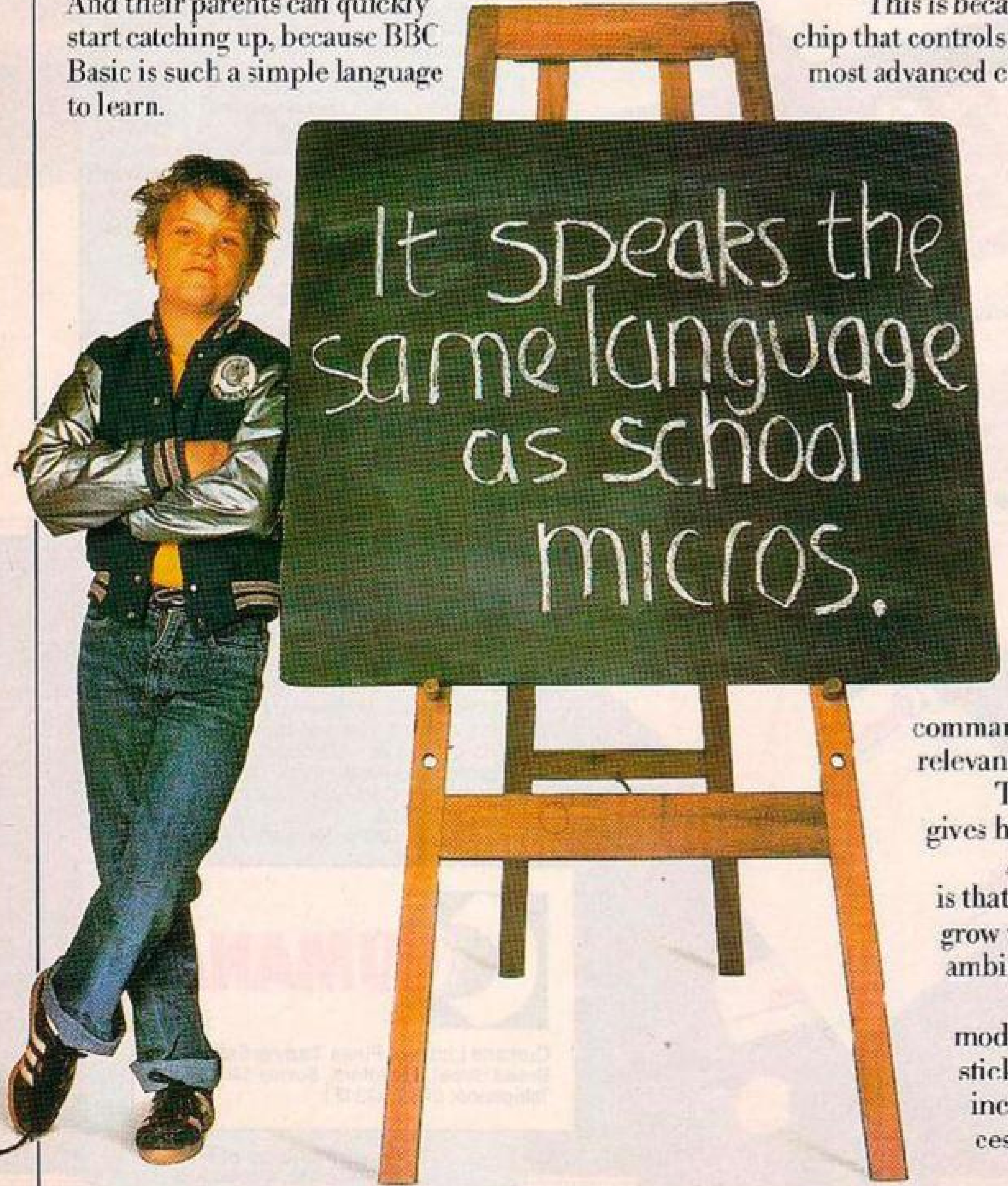
Most schoolchildren will tell you that one computer prevails in British classrooms today. Acorn's BBC Micro.

With a hint of pride, they'll also tell you that they're fluent in the computer language which Acorn developed for the BBC Micro. It's called BBC Basic.

And if you ask their advice on choosing a home computer for around £200, they're likely to tell you that there's really only one sensible choice.

The £199 Acorn Electron.

Like its £399 stablemate, but unlike any other micro, the Electron speaks BBC Basic. Which means that children can easily carry on with their computer studies at home. And their parents can quickly start catching up, because BBC Basic is such a simple language to learn.



However, language isn't the only thing which makes the Electron outstanding among every other micro in its price range.

A powerful choice.

The Electron is a 64K microcomputer which has 32K of RAM, combined with another 32K ROM.

This simply means that it has more power than most people ever need from a home computer.

Nevertheless, it has been designed to help you make the fullest use of its power.

For example, its graphics have the highest resolution of any home computer bar none.

This is because Acorn specially designed the chip that controls the graphics. And it's among the most advanced chips of its kind.

Indeed, it delivers twice as many characters across the screen as the Electron's nearest rival.

It expands into a system.

With the Electron, even total newcomers have been surprised at how quickly they can find their way into the complex world of computing.

Where many computers have keyboards which are confusing and clumsy to operate, it has a keyboard just like an ordinary electric typewriter's.

And for issuing main commands, there are single entry keys. Instead of literally spelling out the command, letter by letter, you just push the relevant key and it's issued.

There's also a built-in loudspeaker which gives high quality sound.

And what is perhaps most exciting is that the Electron has the capacity to grow with your knowledge and ambition.

With Acorn's Plus 1 expansion module, it can link up with a printer, joy sticks and fast-load cartridge software including View and Viewsheet word processing and spread sheet programs.

With the Plus 3 module, which will soon be available, you'll have a disc drive system and will be able to enjoy all the speed and convenience of 3.5 inch discs.

But let's not get carried away too quickly. You can start using and enjoying your Electron as soon as you get it home.

All you need is your television set and a cassette recorder.

The speed of a business micro.

Some home computers respond pretty slowly to your commands. After you've pressed the keys, they leave you twiddling your thumbs for more than a mere few seconds.

The plodders, however, are a very long way behind the Electron.

In fact, on processing speed, a recent bench test survey ranked the Electron up with such high fliers as the IBM PC and the Apple III. Both are machines which cost well over £1,000.

It's an astonishing accolade when the Electron makes no greater claim than to be a micro which is designed to become part of the family.

Your starter for free.

With your Electron, you'll receive a free introductory cassette.

It will give you a taste of the exceptional colour graphics. It will show you how the Electron can play and notate music.

And when it's given you some new ideas about home accounting, it will challenge you to a few games and even spend a few seconds doing your whole family's biorhythms for you.

But remember, although it holds 15 programs, the cassette will only give you a glimpse of the Electron's full potential.

Because the potential is as infinite as your own imagination.

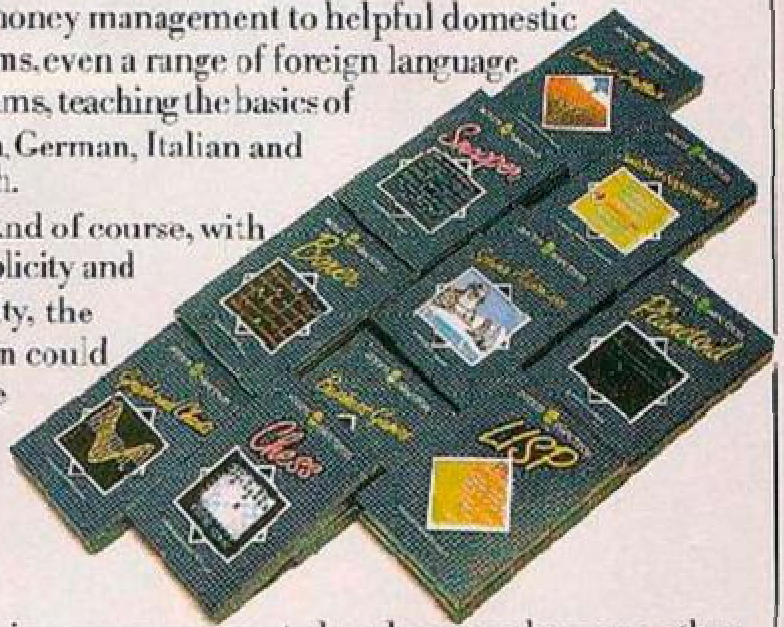
No shortage of software.

Although the Electron is still a relative newcomer to the market, the range of software available for it is considerable.

Besides plenty of games, there are many educational programs for children of all ages, from playschool to A Level.

There's a great deal to keep adults occupied, too. From money management to helpful domestic programs, even a range of foreign language programs, teaching the basics of French, German, Italian and Spanish.

And of course, with its simplicity and flexibility, the Electron could soon be processing programs created and written by none other than yourself.

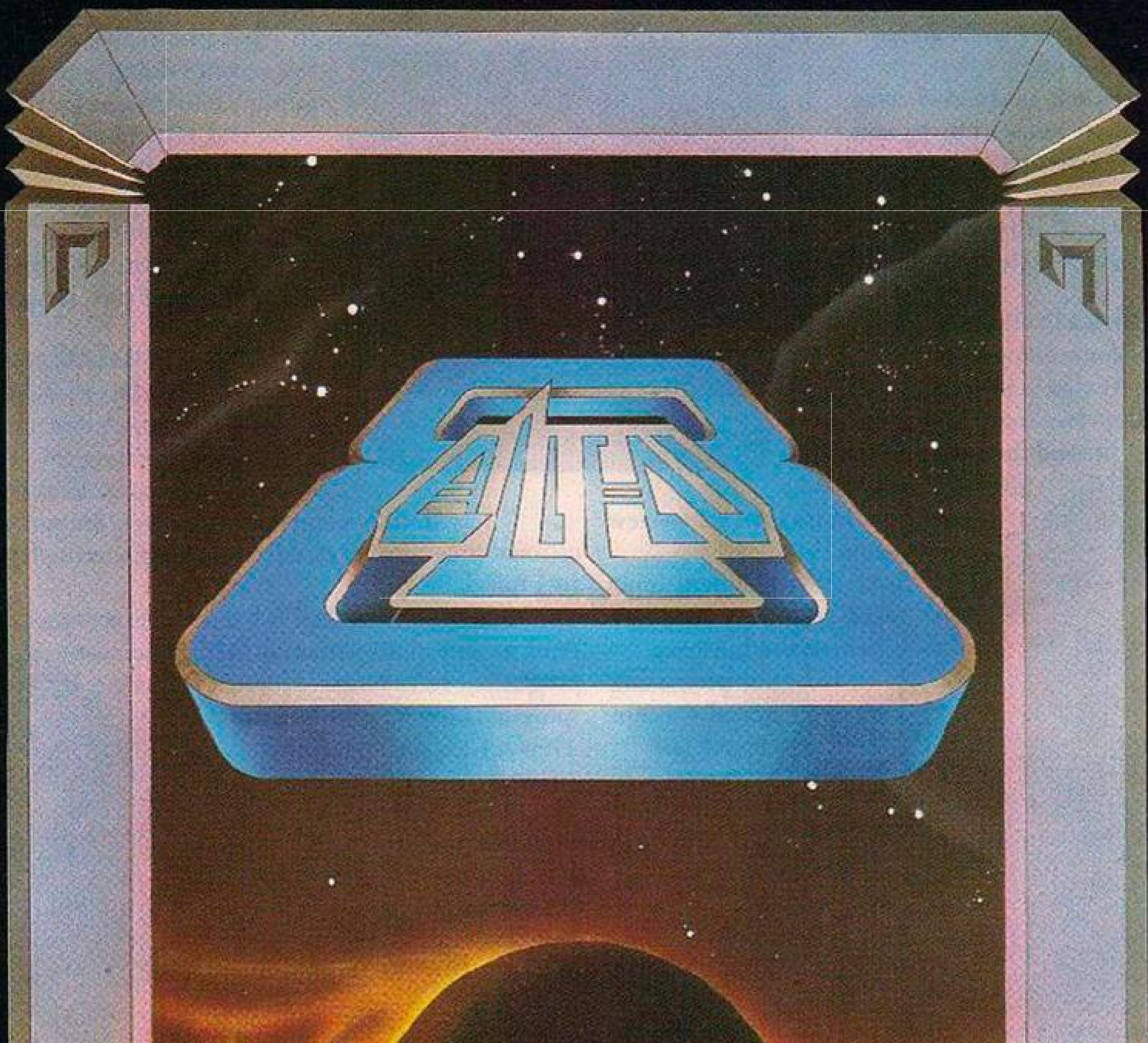


You can find the Acorn Electron with its full complement of accessories and software at local Acorn dealers and major high street stores.

For the address of your nearest supplier, ring 0933 79300.

The Acorn Electron.

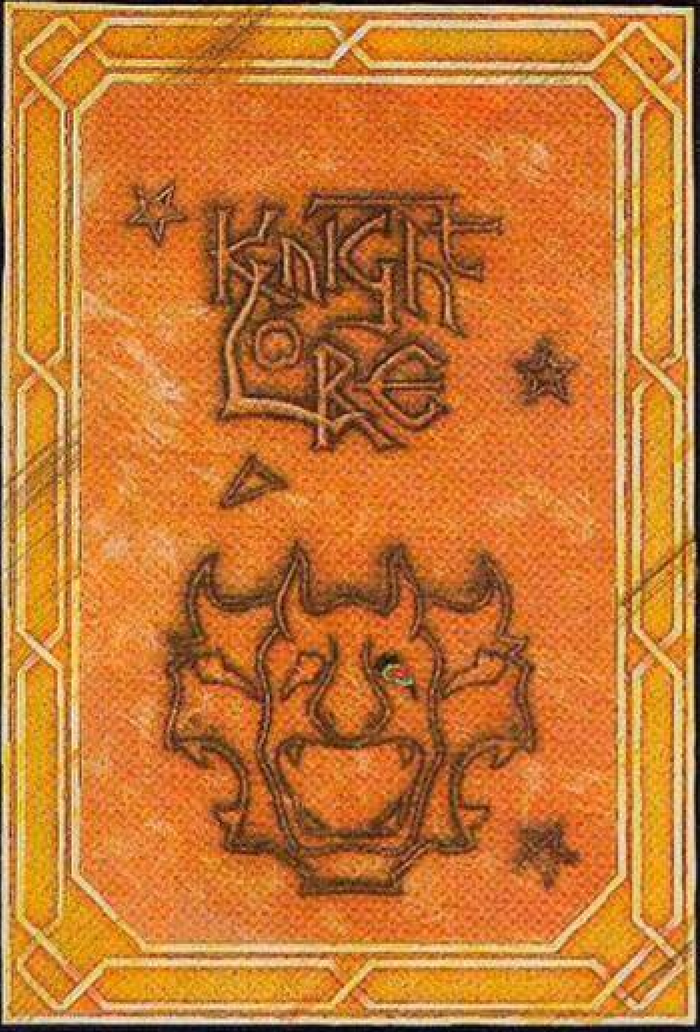
48K SINCLAIR ZX SPECTRUM



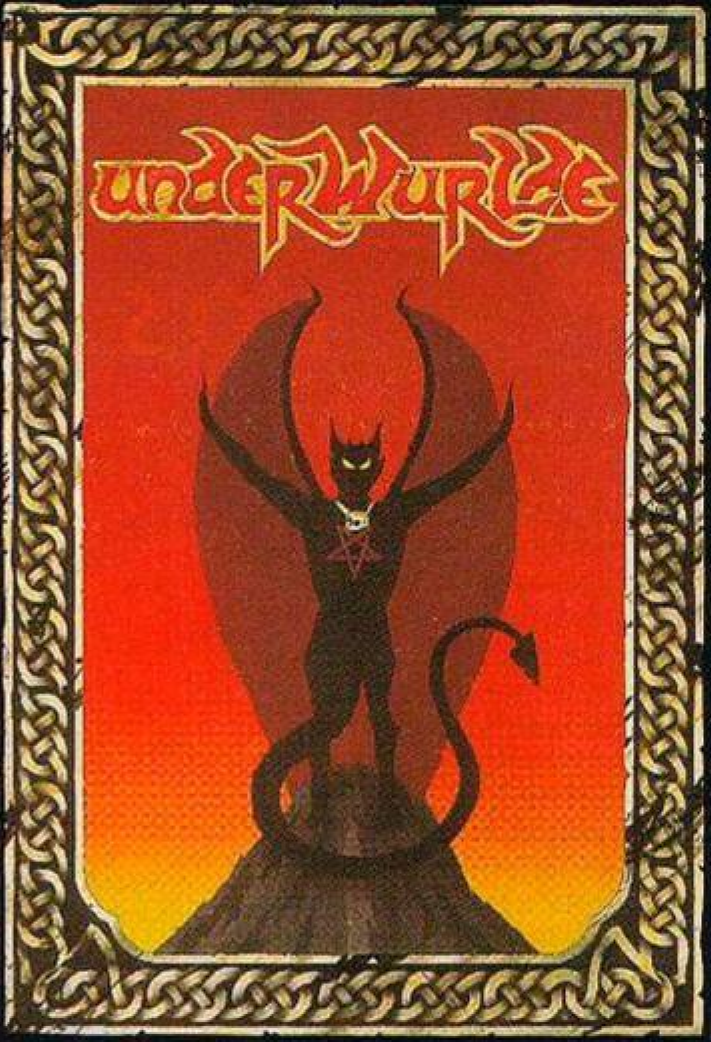
"ALIEN 8" recommended retail price £9.95 inc VAT
Available from W.H.SMITHS, BOOTS, J.MENZIES, WOOLWORTHS
and all good software retail outlets. Also available from
ULTIMATE PLAY THE GAME, The Green, Ashby-de-la-Zouch, Leicestershire LE6 5JU
(P&P included) Tel: 0530 411485

ULTIMATE
PLAY THE GAME

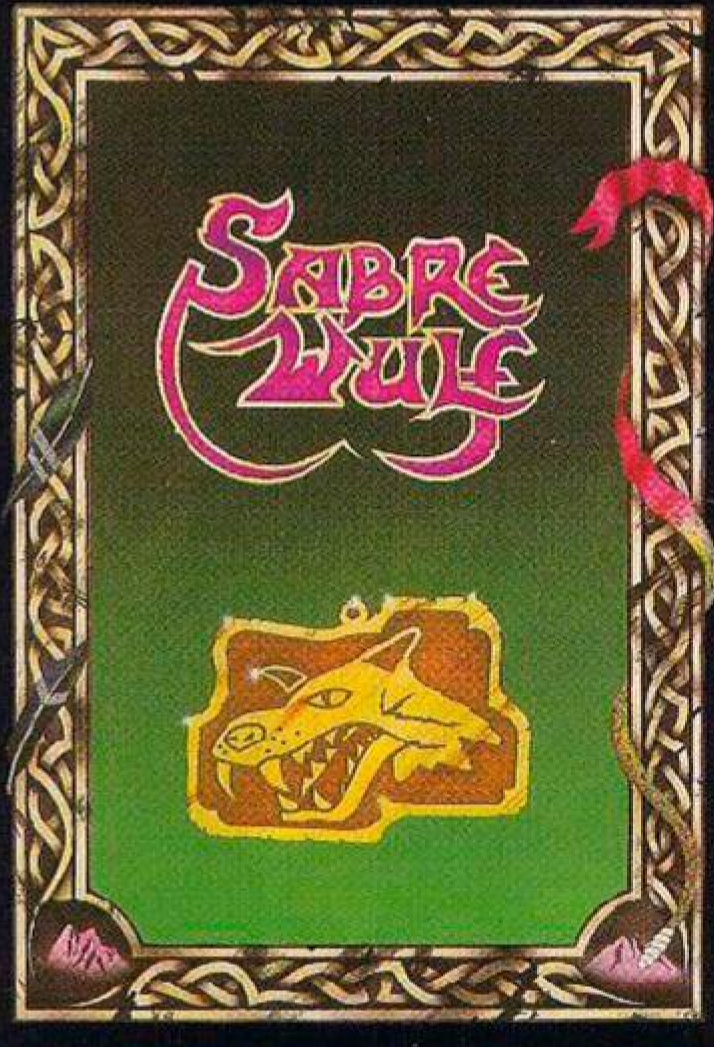
48K SINCLAIR ZX SPECTRUM



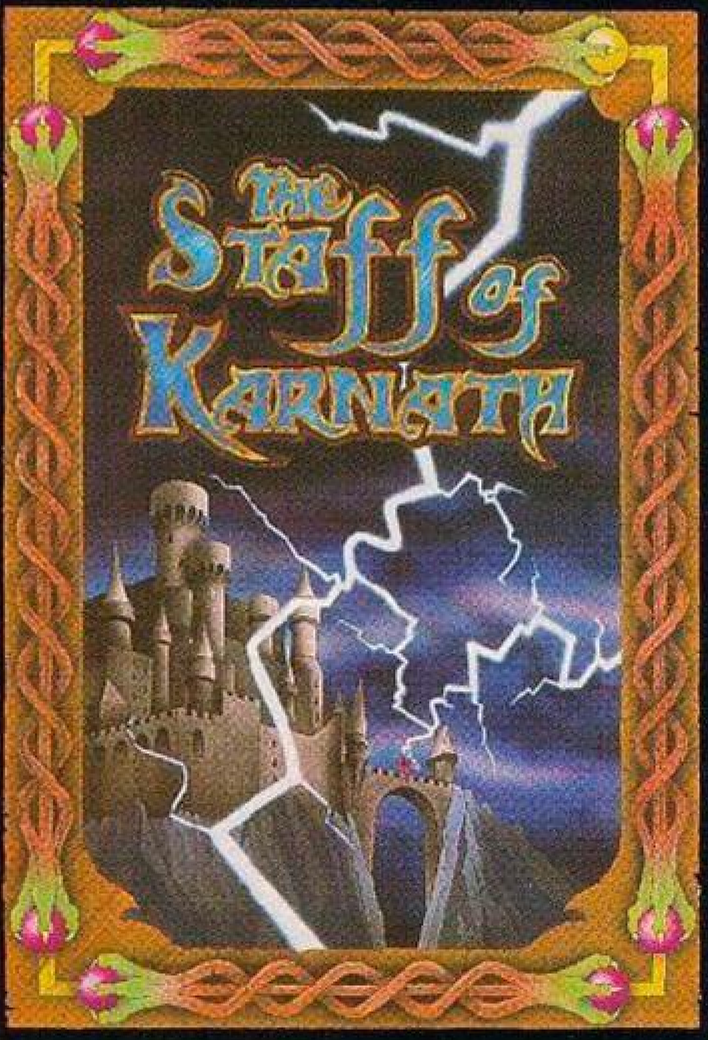
48K SINCLAIR ZX SPECTRUM



BBC MODEL B 1·2 OS
48K SINCLAIR ZX SPECTRUM



COMMODORE 64



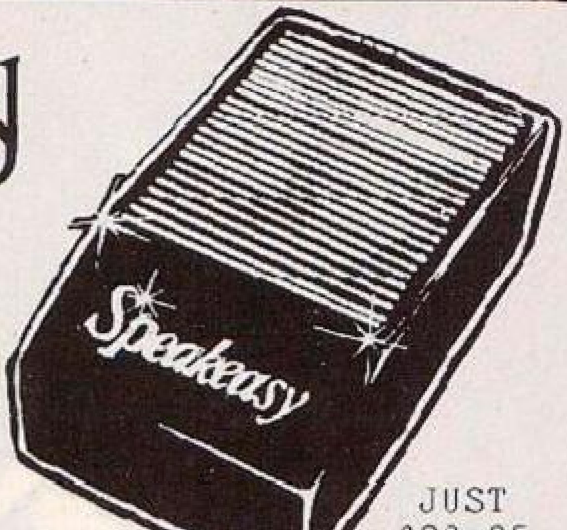
"KNIGHTLORE", "UNDERWURLDE", "SABRE WULF", and "STAFF OF KARNATH" recommended retail price £9.95 inc VAT. Available from W.H.SMITH, BOOTS, J.MENZIES, WOOLWORTHS and all good software retail outlets. Also available from ULTIMATE PLAY THE GAME, The Green, Ashby-de-la-Zouch, Leicestershire LE6 5JU (P&P are included) Tel: 0530 411485

INDIANA JONES TM*
in the
LOST KINGDOM TM*
The artifact is just too tempting. Sure, no one has ever returned with it but they didn't have your brains and courage.
This treasure is worth any risk. An artifact containing the total history and knowledge of a lost, forgotten civilization! Just think what that could do for your career, for the university museum, and for your bank balance!
Of course, there is the small matter of finding it. The perils en route are sure to be the most fiendishly clever traps and puzzles you've ever faced. You'll need all your skill and daring just to survive.
Then there's the ancient curse . . . but what the heck; if it were easy, it wouldn't interest you, Dr. Jones – would it?
C64
CASSETTE
£9·95
Distributed in the U.K. by U.S. Gold Limited, Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Telephone: 021-359 3020.
MINDSCAPE INC
*INDIANA JONES IN THE LOST KINGDOM, game elements and character names and likenesses are trademarks of Lucasfilm Ltd. Used by Mindscape, Inc., Authorised User. © 1984 Lucasfilm Ltd and Mindscape, Inc. All Rights Reserved.

THE INCREDIBLE

Micro Speech Module

Speakeasy



AVAILABLE AT YOUR LOCAL spectrum STORE

JUST £29.95

* UNLIMITED VOCABULARY
* CLEAR AUDIBLE SPEECH
* COMPACT, STURDY & BUILT TO LAST
* USER FRIENDLY
* COMPREHENSIVE MANUAL INCLUDED
* SELF CONTAINED SPEAKER
* FULLY GUARANTEED FOR ONE YEAR
* POWERED FROM HOST COMPUTER

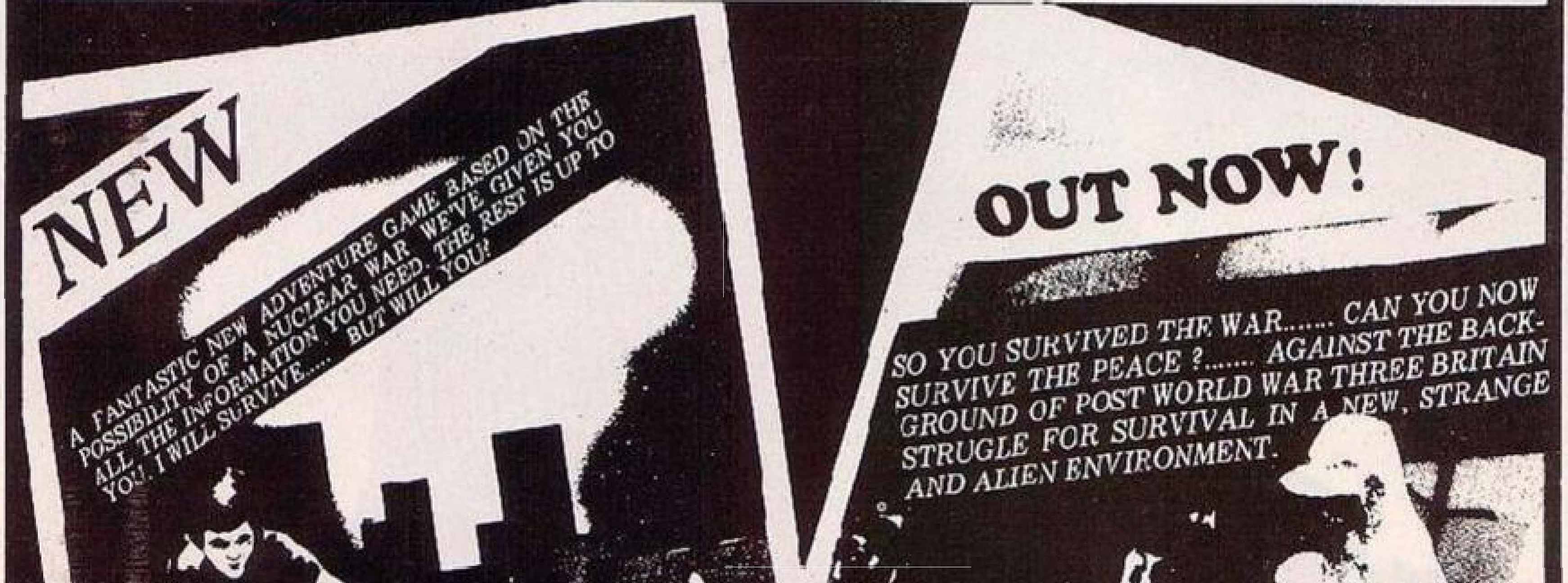
* *VERSATILE! - the standard SPEAKEASY module can be programmed to speak in any language, for example ENGLISH, GERMAN, NORWEGIAN etc..... THE SCOPE OF THIS PRODUCT IS ONLY LIMITED BY YOUR IMAGINATION!*

* *COMPATIBLE with most popular micros. The standard module can be connected to virtually any computer via our large range of interface cables.*

INTERFACE CABLES CURRENTLY AVAILABLE		
*CBM 64	*BBC	*AMSTRAD CPC464
*VIC 20	*ORIC/ATMOS	*MSX RANGE
*CBM PLUS 4	*CBM 16	*CBM 116
*DRAGON 32/64	*MEMOTECH 500/512	*SHARP MZ 700

REMEMBER!... If you change your computer, you only need to change the interface cable!

PLEASE STATE INTERFACE LEAD REQUIRED



AZTEC SOFTWARE LIMITED, 17A STATION ROAD, MIRFIELD, WEST YORKSHIRE. TELEPHONE: (0924) 492826

Herbie Briggs has just destroyed the myth that all floppy discs are created equal.

They seem equal. Until you look at the seams.

That's where equality ends.

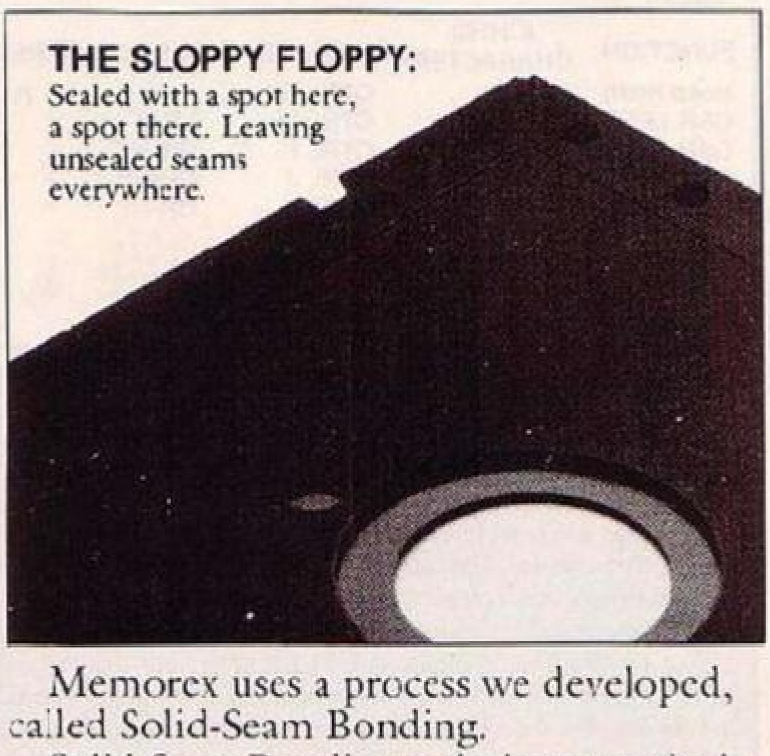
Most companies seal their discs with a spot here, a spot there. Leaving most of each seam not sealed at all.

Sooner or later, the seams might do what comes naturally: they bulge. Warp. Pucker. Open up.

Pens, pencils, fingernails—even a four-year-old's, like Herbie—can catch and snag in those wide open spaces.

That's sloppy. And dangerous. Because if you put a sloppy floppy into your disc drive, it can jam your drive. Ruin your drive head. Lose your data.

So much for their seams. Ours are different.



THE SLOPPY FLOPPY: Sealed with a spot here, a spot there. Leaving unsealed seams everywhere.

Memorex uses a process we developed, called Solid-Seam Bonding.

Solid-Seam Bonding seals shut every inch of every seam of every Memorex® floppy disc. Tight as a drum. That makes the Memorex floppy stiffer. Stronger. And your data safer.

To resist bulging, warping, puckering, or opening up.

MEMOREX SOLID-SEAM BONDING: Every inch of every seam is sealed shut. Tight as a drum.

To resist all the things that can jam your drive, ruin your drive head, or lose your data.

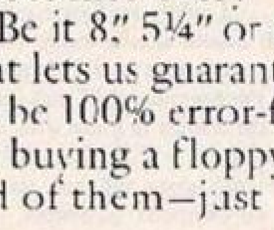
Which proves that a Memorex floppy disc isn't equal to all the others. It's better.

Solid-Seam Bonding is just one example of the extra care that goes into every Memorex floppy disc. Be it 8," 5¼" or the new 3½." Extra care that lets us guarantee every Memorex disc to be 100% error-free.

The next time you're buying a floppy disc—or a few hundred of them—just remember this:

It's always better to be safe than sloppy.

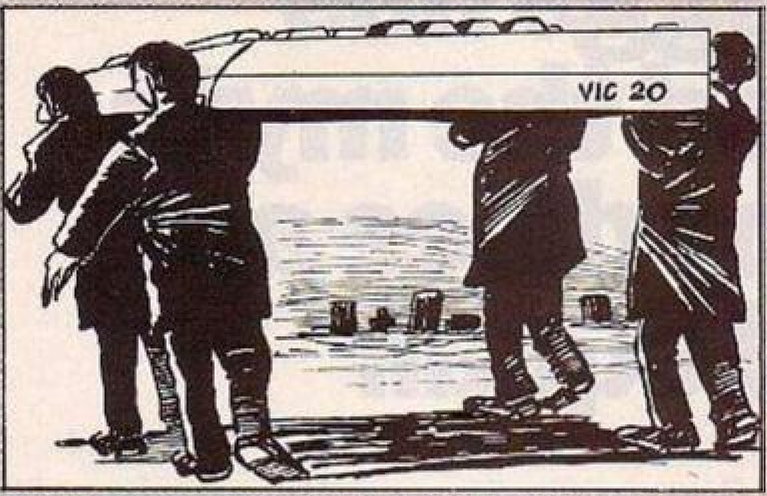
For more information on the full line of Memorex quality computer media products, including computer tape, call Memorex U.K. Ltd., 96-104 Church Street, Staines, Middlesex. Tel: 0784 51488



Your Data. When it matters, make it Memorex.™

MEMOREX

EPITAPH FOR ONE OF THE BEST



As a one-time owner of the Vic-20, I felt that I could not let this Grandaddy of computers be put to rest without, at least, a brief eulogy.

Since the Vic-20 was brought onto the market, a lot has changed in the world of computers. Its limited graphical and musical capabilities plus its minute memory did not give it much of a chance against today's 64K hi-res maestros.

Even so, the early days of Vic-computing will always be, for me, the "good old days". These were the days when you struggled to fit a lot of program into a tiny bit of memory — a thing that every computer-programmer ought to have to do. The mega-memories of today's 64K elephants are asking for sloppy and wasteful programming.

I will never forget the hours I spent typing the latest Basic program from the pages of *Your Computer*, because there was nothing else available. Does anyone do this today? Back in the days of Vic, you spent nights poring over hand-assembled machine code. Compilers were things you dreamt of after your trusty Vic-20 had crashed for the fifth time.

Don't get me wrong, the computers of today are a lot better than the Vic-20 but, somehow, all the fun has gone out of computing, as I knew it.

The computers of today and their owners have a lot to thank the Vic for. I am sure that the passing of this Model T of the computer world will squeeze a tear or two from the eyes of many a computer enthusiast.

Matthew Longham,
West Germany.

GREAT SCORES!

Start with the flattery they said so . . . I avidly read your magazine each month among many other computer magazines and I certainly put it in the first two and I will leave you and the readers to guess what the other title is.

I read with scorn the vast scores claimed by computer gamesters, the thousands, hundred thousands and even millions look puny when viewed against the magnificent, astounding 3D, mighty, state of the art achievements that I have obtained. Just read this list and listen to the gasps of wonder from the readers . . .

In Raid over Moscow I have destroyed 10,234 stealth bombers and all of those inside the hanger which I have not managed to get out of yet. In Zaxxon 23,346 jets have hit the wall that scrolls toward you at the very start — I simply cannot find the first opening even. On a fight simulator I have crashed 40,000 times at Gatwick and in Solo Flight I actually crashed my CBM-64 by going as high as possible and then diving into Kansas at full speed.

On Flight 737 I cannot even find the damn runway and wander aimlessly about all over the flaming airfield until I go off the edge. In Blue Max for some strange reason if you pull back on the stick you crash forward and by reversing the joystick I can now hit the tree at the end of the runway every time. At the Royal Birkdale golf I went round in 18,000 strokes over par and in International Football I lost 42 nil to the computer at level one.

I could go on for ever but I don't want to make other readers despondent about their own achievements. I must mention that in the Hobbit I have had 14,000 attempts to get the small door open in the very first scene and always end up jumping in the small chest which is always empty. Why do they make these games so easy???

R. Orlandini,
Staviero,
Isle of Wight.

NOT A SYNTH

In many articles and adverts the sound facilities on many computers are said to be the same as those found on synthesisers. This is not the case. In fact, on most computers you can define envelopes, pitches and the noise level, but they are missing a function which sound generators need to have to be called a synth: the ability to change the timbre or amount of harmonics — many harmonics = sharp sound, few harmonics = soft sound. It's usually a low-, high- or bandpass filter that's used to do this.

I'm saying this to warn people who are looking for a synth from making the mistake of buying what they think is a computer-based synthesiser, but which actually is a computer-based sound generator — I've nearly done it myself: advertisers fault!

As far as I know the only machines which have a built-in synth are these: Yamaha CX5, Commodore 64 and Enterprise.

Johnny Brinks,
Elsinore,
Denmark.

TELSOFT WORKS!

I have just tried two programs, Darts and DataCalc, since keying in Telsoft on Thursday evening. Both came over well — very few bad blocks and I'm very pleased with the results. Micronet is disastrous — I cannot get it to download with anything above a five per cent chance of success.

I have a Universal Modem Adapter which has enabled me to access Micronet and Viewfax in the past. Unfortunately, they have dropped ZX-81 software altogether. The problem with keying in your long machine-code programs is that it is all too possible to get them wrong. The checksum is no proof against getting values in the wrong sequence or overwriting another area of memory.

If you ignore the intricacies of 40 column display shifting etc to accommodate Prestel on a ZX-81 then your class of downloader is ideal.

Anyway — you may be interested to know that Telsoft is fine on BBC B in Cheshire via an acoustic modem.

Ray Pearson,
Northwich,
Cheshire.

AMSTRAD DATA

I would like to clear up a few points about the Amstrad CPC-464, following information given in the January issue:

■ Pages 145-148: The Sprites article implies the 464 won't scroll its windows. It will scroll, both up and down, any of its text windows. The general form of the required code is:

```
DOWN Locate n,l,l:print n, "cursor
        up"
UP   Locate n,l,m:print n, "Cursor
        down"
```

where n is the channel (window) number and m is the number of rows in that window.

If the whole-screen scrolling is required, the window 0 has not been altered from its start-up definition, then the following is all that is needed:

```
DOWN Locate l,l: print "Cursor
        Up" — or 2 "(Ctrl) £(Ctrl) K"
UP   Locate l,25: Print "Cursor
        Down". Obviously this tech-
        nique does disrupt the
        cursor position.
```

■ Page 161: Symbol after 127 would allow re-definition of characters 127-255, not 128-255.

■ Page 173: The circle-drawing routine given in program 2 takes an unacceptably slow 12 seconds to draw one circle. The following takes less than 2½ seconds, and if Step 2 is

Table 1.

FUNCTION	(CHR$) CHARACTER	KEYBOARD	JOYSTICK	SCREEN
Beep (Bell)	7	CTRL G		R
CSR LEFT	8	CTRL H	LEFT	
CSR RIGHT	9	CTRL I	RIGHT	
CSR DOWN	10	CTRL J	DOWN	
CSR UP	11	CTRL K	UP	
CLEAR WINDOW	12	CTRL L		
RVS	24	CTRL X		X
CSR HOME	30	CTRL £		

ZX-81 MICROS DESERVE BETTER

The survey conducted by Sharpey among Open University students, November 1984, *Your Computer* may have surprised a few people. The position of the BBC B and Spectrum as the most owned micros was to be expected, but the third place obtained by the ZX-81 ought to — though I very much doubt it will — make a few publishers and software manufacturers think again about so readily ignoring this pioneer of home computing.

That the machine is outdated I do not deny, but this is surely offset by the extremely low price at which it is now selling. Software and books for the ZX-81 have become extremely rare, while publishers of computer magazines seem to have forgotten that it ever existed.

There are, of course, some exceptions. Most notable are Software Farm, who are producing probably the best games ever seen on the ZX-81 and *Your Computer* whose listings are, in the main, superior to most commercial programs. So I appeal to publishers of books and software for the ZX-81. Please continue to publish, and please let us know that you are continuing to do so via advertisements.

S.F. Kaliszczak,
Lytham, Lancashire.

inserted after the For i% = 1 to 45, an acceptable circle is produced in just 1½ seconds.

```
10 MODE 1 :CLS : r% = 100 : x% =
   320 : y% = 200: DFG: ORIGIN
   x%, y%
20 FOR i% = 1 to 45 : a% = r%
   * COS (i%) : b% = r% * SIN
   (i%) : PLOT a%,b% : PLOT -
   a%,b% : PLOT a% - b%
   PLOT - a% - b% : PLOT b%,
   a% : PLOT - b%, a% : PLOT
   b%, a%, PLOT - b% a%
   NEXT
```

■ Table 1 will help new users track cursor up/down control characters as the manual is not particularly helpful on this matter. They can all be used in the same style as C3M's cursor symbols:

■ The 464 manual fails to give an example of how to print a multicolour character. The following will print a wine glass, and characters high and outlined in black on a white background, filled with red wine, standing on a blue mat.

```
 10 MODE 1 : INK 0,26 : INK 1,0 : INK
    2,6 : INK 3,14 : PAPER 0 :
    BORDER 0 : CLS
 20 SYMBOL after 200
 30 SYMBOL 200,0,0,254,130,130,
              130,130,68
 40 SYMBOL 201,40,16,16,16,56,124
 50 SYMBOL 202,0,0,0,0,0,124,
              124,56
 60 SYMBOL 203,16
 70 SYMBOL 204,0,0,0,0,0,0,254
 80 glass $ = CHR$ (200) + "   ←"
 90 wine $ = CHR$ (202) + "   ←"
100 Mat $ = CHR$ (204)
110 PRINT CHR$ (22) + CHR$ (1) :
    REM turns on transparent mode
120 FOR x% = 1 to 37 STEP 4 :
    FOR y% = 1 to 21, STEP 4
130 LOCATE x%,y% : PEN 1 :
    PRINT glass$ ' · " : PEN 2:
    PRINT WINE $ "←" : PEN 3 :
    PRINT mat $ : NEXT : NEXT
140 PRINT CHR$ (22) + CHR$ (0) :
    REM reset to normal mode
150 PEN 1
```

■ Finally, new users will find useful the use of Ctrl and CSR keys to jump from one end to the other of a long line of Basic during editing. Also not mentioned directly in the manual is the possibility of re-executing a simple Basic instruction in a similar way to the CBM computers.

Cursor up to the line required, "wipe" across it with the copy key, over-typing any changes on the way, and press Enter. The command will be obeyed, without the need for re-typing it, or Copying it to a fresh screen line.

F Merfit,
Crawley,
West Sussex.

CORRECTIONS

There is an error in the hex loader for the Spectrum game, Space Evaders, in the January issue. LET a=0 at the end of line 70 should be deleted and re-inserted at line 65

Before typing in the hex loader in January's Dragon program, Reversi, you need to reserve space for the machine code by typing PCLEAR 8.

More machine code was given than is necessary in the listing for CBM 64 Tiradians in January. When the hex loader asks you to input the start position, enter 3700 and ignore the code from 36D0 to 36FF.

EDITORIAL

PRICE WAR — HUH! What is it good for? Absolutely nothing. That's what the computer manufacturers would have us believe, but when did the public ever lose out from cut-throat competition in the micro industry?

The last major price battles were fought in 1983 when Sinclair sparked a new conflict by pulling the Spectrum down to £130 and £100 from its original £175 and £125. Commodore answered swiftly with Vic-20 cuts and the whole campaign had fizzled out by that Christmas.

The result? — a lot of satisfied new customers and a body count of computer manufacturers featuring big names like Texas Instruments and Mattel, and several smaller ones such as Grundy and Jupiter Cantab.

All the signs are right for a new round of cuts this year, but this time Atari is the company leading the downward price charge. That may seem ironic — Atari was another of the once-powerful to fall victim in the 1983 wars. It lost $180 million in the last three months of 1983, and those financial wounds lay directly behind its sale to Jack Tramiel in the spring of last year.

Atari had hoped that the XL range of computers would lead to a return to better fortunes. In 1983 few would have expected that the £250 top-of-the-range 800XL would become Christmas 1984's bargain at £130 — and how there is talk of another cut to take the 800XL below £100.

Alone, that would hardly be enough to spell cheaper computers for everyone. But it is one of several movements which could add up to important changes in pricing this year.

How well computers sold at Christmas is the first key. Although the end-of-year boom couldn't be described as disastrous for companies like Sinclair, Commodore and Amstrad, it did arrive very late with all the activity concentrated in the last couple of weeks before the 25th.

That has resulted in larger warehouse stocks of unsold machines than expected.

Japanese dreams of an MSXmas failed to become reality, hit first by a lack of interest and then by the weak pound. Toshiba has already dropped its HX-10 to under £200 and the other MSX makers will be forced to follow suit to get their over-priced machines moving.

Even though Sinclair can outsell his competitors with the Spectrum even at its current price, he is well placed to make cuts if he has to. The profit margins in the Spectrum's prices are large enough for him to move them down a long way even if this time it isn't Sinclair who starts the war. The low chip count in Commodore machines will also permit them to rejig prices if they want to initiate the moves to get the market moving again.

It is an open secret that following the Electron principle Acorn is re-engineering the BBC Micro to reduce production costs and increase margins. That in turn could allow for price cuts. Late-comer Enterprise might also be obliged to look at a new price structure.

The final factor that hints at lower-cost computing is the number of new computers in the pipeline. Commodore as well as Atari have unveiled their latest products — see this month's news pages — and the Atari cuts already mentioned are clearly in preparation for the new machines. Commodore may also reposition the computers in its existing range by dropping prices and possibly machines.

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Why not give it a try? You have nothing to lose but your postage.

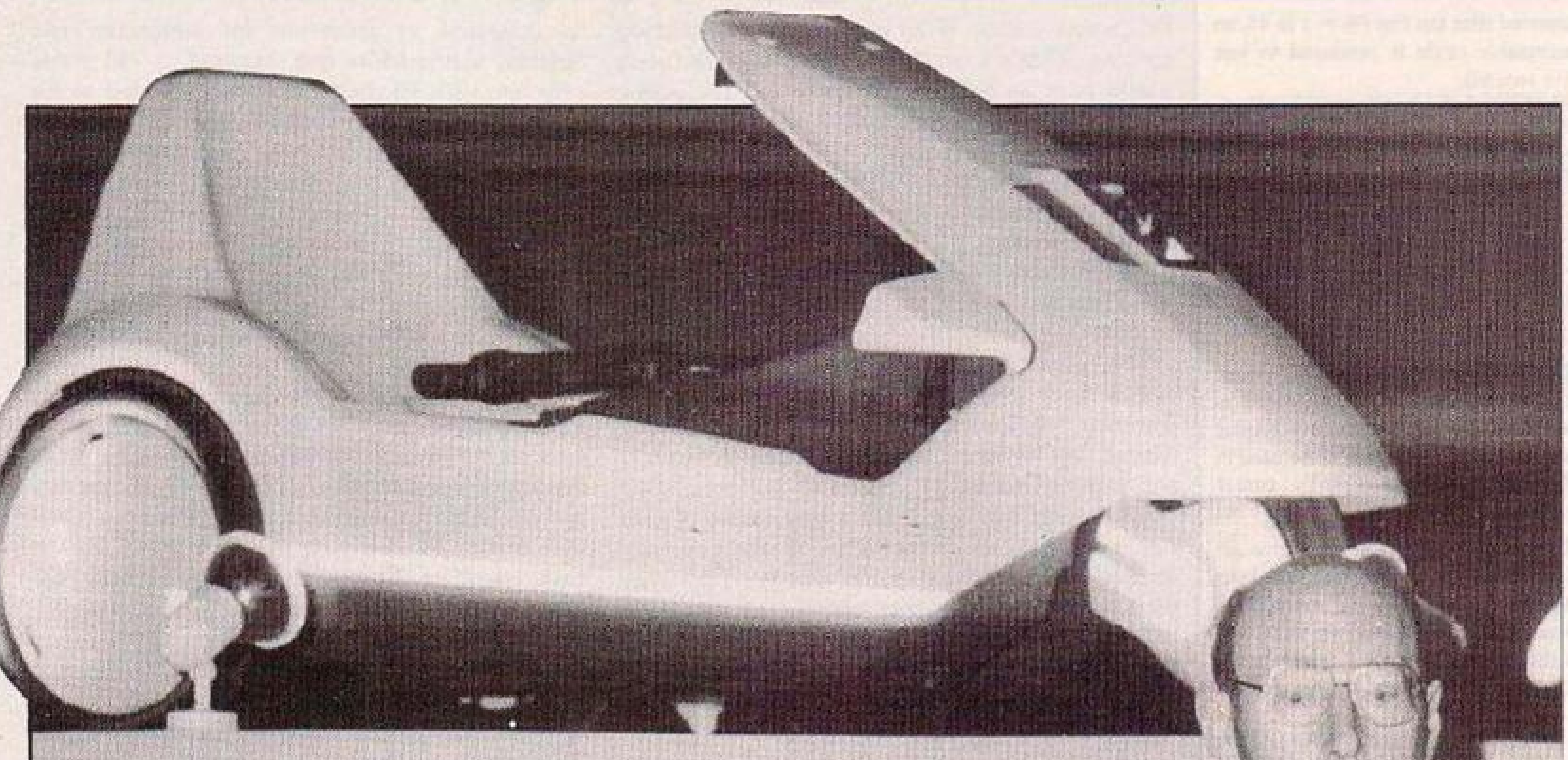
Editor
TOBY WOLPE
Assistant Editor
MEIRION JONES
Production Editor
IAN VALLELY
Software Editor
SIMON BEESLEY
Sub-editor
PAUL BOND
Editorial Assistant
LEE PADDON
Editorial Secretary
LYNN DAWSON
Editorial: 01-661 3144
Subscriptions: U.K. £12.50 for 12 issues.

Printed in Great Britain for the proprietors Business Press International Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500 Telex/grams: 892084 BIPRESG. ISSN 0263-0885. Printed by Riverside Press Ltd, Whitstable, Kent, and typeset by Instep Ltd, London EC1.

ABC
154,334
January-June, 1984.

Advertisement Manager
NICK RATNIEKS 01-661 3127
Senior Sales Executive
JULIAN BIDLAKE 01-661 8458
Advertisement Executives
NIGEL BORRELL 01-661 3660
KAY FILBIN 01-661 8484
Northern Office
GEOFF PARKER 061-872 8861
Advertisement Secretary
MAXINE GILL
Classified
LUCY O'SULLIVAN 01-661 3036
Publishing Director
CHRIS HIPWELL
Group Advertisement Manager
SHOBHAN GAJJAR

Your Computer, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.



Knight on a white recharger saves British tricycle industry

SINCLAIR'S £400 ELECTRIC VEHICLE is more of a toy than the "ideal solution for all types of local journey" which the brochure claims although under current regulations anyone over 14 can drive the C5 electric tricycle on the road without insurance, tax or crash helmet.

The C5 looks a little like a small bobsleigh and going down the snow covered slopes of Alexandra Palace where it was launched it sometimes performed like one. However the 250 Watt electric motor which drives one of the back wheels proved incapable of powering the C5 up even the gentlest slopes without using pedal power. The tricycle soon started making a plaintive "Peep, Peep" noise signalling that the engine had overheated.

On the flat track inside the Alexander Pavilion the C5 showed how much fun a lightweight electric vehicle can be in a controlled environment. The three guiding principles of the Sinclair Vehicle Project as outlined by Managing Director Barry Wills are lightweight materials, good aerodynamics and traditional battery technology with an unconventional approach to design going back to first principles rather than adapting existing vehicles. "We don't take a standard car, van or bus" says Barry "and rip out the engine to replace it with batteries and electric motor."

The C5 is compromised by the need to sneak in under the quaintly named Electrically Assisted Pedal Cycle Regulations 1983. This lays down a maximum power of 250 Watts for the engine which gives the C5 a top speed of 15 mph on the level — less than most cyclists would manage.

With one lead acid battery on board the tricycle has a range of 20 miles before it needs recharging but it can carry a spare battery which doubles its range without exceeding the 60 Kilogram weight layed down in the regulations.

Although the C5 is built by Hoover at Merthyr Tydfil in South Wales Sir Clive cast doubts on rumours that it is powered by a motor that would be more at home in a domestic appliance. He admitted that the company in Italy which builds the engine "does make washing machine motors "but added mysteriously that it "also makes torpedo motors".

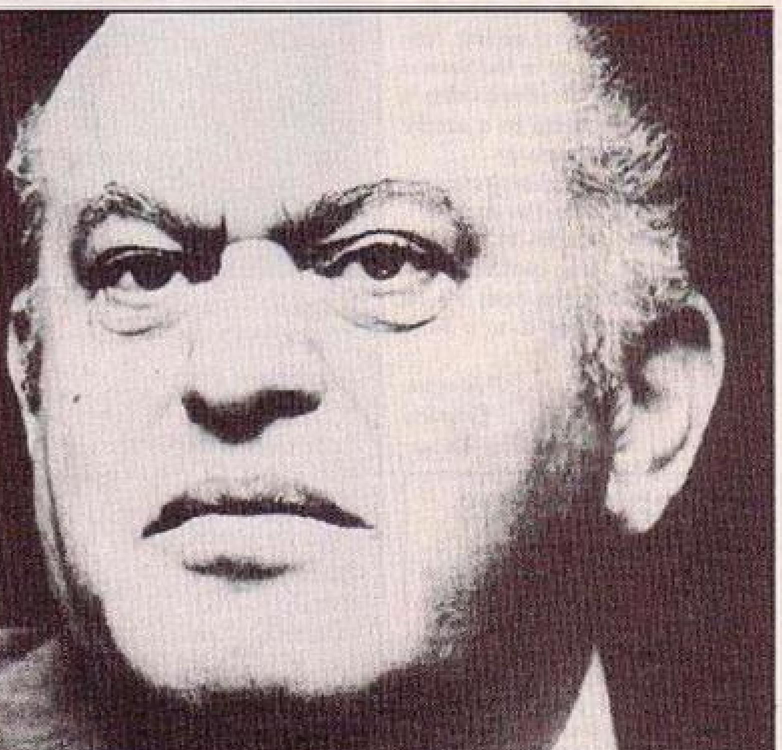
Be that as it may a periscope would be handy if you intended driving the C5 on busy roads since your head is only at bonnet level. The steering is controlled by a crossbar under your thighs.

Tramiel stares into infinity as X13 and 5T rangers see the light

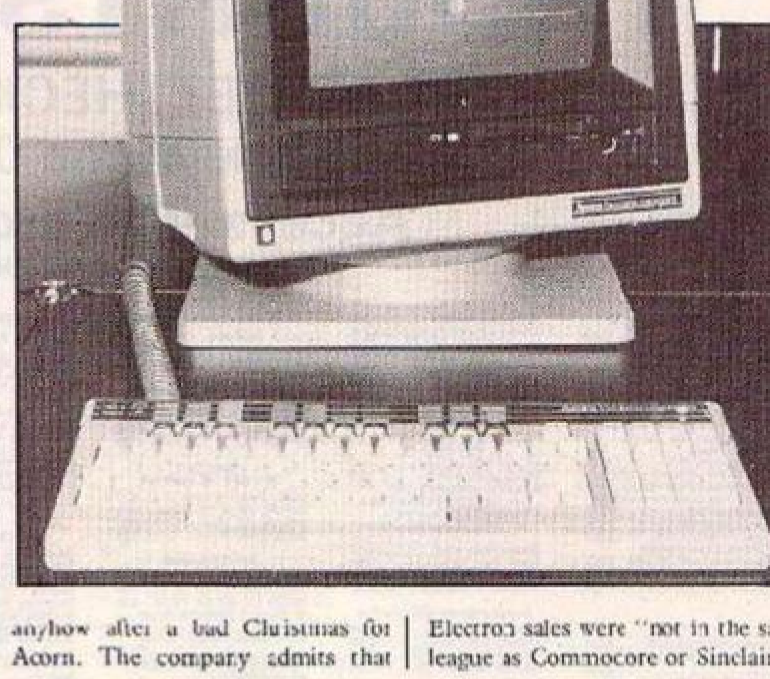
TRAMIEL WANTS more blood so the price of the 800XL is to be forced down yet again to £99 as part of a worldwide price war, and meanwhile in Las Vegas Atari's combative chairman showed the new Atari XE and ST ranges, outlined in *Your Computer* January, for the first time.

The XE is what Atari is calling the 8-bit range developed from the 800XL. The standard revamped 800XL will cost $120 in the United States with the 65 XEM music version incorporating a synthesiser at $160 and the 128K 130 XE at $200. The more expensive 65 XEP portable incorporates a 5 inch monochrome screen and 3.5 inch disc drive

What really impressed visitors to the Atari stand at the Las Vegas Consumer Electronics Show was the software demonstrated on the new machines — especially a package called Infinity which incorporates windows, a friendly Help function and integrated spreadsheets, word processor and relational database.



Atari's new QL bashers based on the 68000 will start at $500 with the 130ST which has 128K, mouse, icons and all which begins to sound more like a Macintosh than a Sinclair, and goes up to $300 for the half-megabyte 520ST. Also scheduled are low priced 250K, and 500K drives with a 10 Megabyte hard disc coming too. Atari UK is saying nothing yet about when we can expect to see these machines this side of the Atlantic or what the prices will be.



Personal Assistant is undercover BBC B

ACORN HOPES to have the first of its ABC computers, based on a re-engineered BBC-B in the shops by the end of the month.

The Personal Assistant as the bottom of the range model is called will be a packag of a new keyboard containing a slimmed down BBC and built-in View word processor and Viewsheet spreadsheet on rom together with a monochrome screen including a built-in disc drive drive. The price is likely to be less than £1,000.

The reduced chip count — Electron style — will also be used in the BBC which will be able to offer additional features or dramatically drop in price as a result. A tight-lipped Acorn spokesman would only say "that's one of the ways of making it cheaper to produce".

Price cuts for the BBC are coming anyhow after a bad Christmas for Acorn. The company admits that Electron sales were "not in the same league as Commodore or Sinclair,"

QL helps out gardeners

PATRICIA AND TONY Hodd want to turn the Sinclair QL from a home computer into a garden computer.

The Shrub Data Bank and Planner is designed to run alongside the Archive data base and it will then answer questions like "shrub, fragrancy, hardy" to describe what you want then "complete shade, moist" to describe the habitat it will have to survive in. Back will come the following suggestions "Elder, Privet, Skimmia, Winter Jasmine and Wisteria."

The Hodds are keen conservationists — with a history of wild life research in India who now live in Llangeitio Nurseries, Llangeithio, Tregaron, Dyfed, SY25 6QG which is where you should send your £12 if you want a copy of the program on Microdrive cartridges.

Schizoid Commodore shotgun blasts 64, 128 and CP/M targets

THEY CALL it "The Shotgun" — not because of the war with Atari but because the Commodore 128 hits three target audiences simultaneously.

First it is an important new machine in its own right with 128K RAM and yet another new, improved Basic 7.0. Second it can cut itself in half — the sawn-off shotgun — to run all Commodore 64 software — giving it an instant software base — and third it can run CP/M using a Z-80 processor in addition to its 6502 derived 8502 processor.

The 128 costs $250 and was officially launched at the January Consumer Electronics Show in Las Vegas, but with the exchange rate plummeting it is difficult to predict the British price when it arrives in the early summer. Commodore is also launching an IBM PC lookalike which may eventually come down to home computer prices and a portable called the LCD.

Match day for Amstrad

MATCH DAY from Ocean is likely to spread from the Spectrum to the Amstrad. Despite the problems of programming on the Spectrum Jon Ritman and Chris Clarke have produced a game which looks almost as good as International Soccer on the Commodore 64 as well as giving as good a game.

Ocean Producer Jon Woods claims that in some respects notably price — £7.95 it is better. Also "on the Commodore game players can walk through each other, on ours they can't."

Cambridge ain't big enough for both of us

SIR CLIVE'S much publicised Christmas punch up with Chris Curry of Acorn in the Baron of Beef pub in Cambridge is not the only example of an isolated occurrence in the computer industry.

The two multi-millionaires may have been unlucky to have been caught brawling in public after their respective companies end of year parties but similar feuds have been running elsewhere. According to one bruised Imagine refugee "Cambridge" is more mature and civilised" than most of the rest of the industry.

Up in the wild North-West Fireiron which is supposed to be finishing the megagame Bandersnatch — another Imagine refugee — has been harassed by the arrival of a whole stream of unsolicited goods and services including a rubbish skip, 20 fire extinguishers 6 desks and a flood of junk mail.

Meanwhile Sinclair is supposed to have "made contact again" with "scum" as he called his ex-employee Chris Curry and the pair are supposed to be the best of friends again. The fracas happened on the Friday before Christmas when Sir Clive lashed out with a furled copy of a magazine because he was angry about Acorn's "dishonest" advertising.

Traditionally Sinclair customers in a similar situation have just written to the Advertising Standards Authority to complain that the 28 days advertised has not been complied with — let's hope Sinclair has not set a precedent for more direct action by his customers.

Portable and powerful, Brother's TC-600 is the next development from the EP-44 with more communications ability, more memory and a simple built-in word processor.

YOUR COMPUTER TOP 20

Game	Company	Machine
Airwolf	Elite	Spectrum
Booty	Firebird	Spectrum
Bruce Lee	US Gold	CBM 64
Combat Lynx	Durell	Spectrum
Daley Thompson Decathlon	Ocean	Spectrum
Elite	Acornsoft	BBC
Eureka	Domark	CBM 64
Fall Guy	Elite	Spectrum
Ghost-busters	Activision	CBM 64
Havoc	Dynavision	CBM 64
Hunchback II	Ocean	CBM 64
Knight Lore	Ultimate	Spectrum
Lords of Midnight	Beyond	Spectrum
Pyjamarama	Mikro Gen	Spectrum
Raid Over Moscow	US Gold	Spectrum
Savage Pond	Argus	Electron
Tir Na Nog	Gargoyle	Spectrum
Travel with Trashman	New Generation S/W	BBC
Under-wurlde	Ultimate	Spectrum
Zaxxon	US Gold	CBM 64

THOUGHTS & CROSSES

37 MARKET STREET, HECKMONDWIKE, WEST YORKS.

Telephone 0924-402337

Access Visa order 0924-409753

ALL PRICES INCLUDE VAT AND DELIVERY

COMPUTERS

BBC B £399
BBC B with DFS £499
BBC B with Torch Z80 .... £446
Electron £189
Electron £199
(with 5 free tapes)
Electron £225
(with free cassette recorder + 4 tapes + 'Me and My Micro' book)
ZX Spectrum 48K £129
(with free software worth £57)
ZX Spectrum Plus 48K £179
(with free software worth £50)
Memotech 512 .... £275
Commodore 64 .... £189
Apple IIe with 2 disk drives and controller £985
Amstrad (green) CPC464 .... £239
Amstrad (colour) CPC464 .... £349
Sinclair QL £399

PRINTERS

Canon PW1080A N.Q. £325
Kaga Taxan KP810 with N.Q. £305
Canon PW1080A + Sinclair QL Interface £360
Canon PW1156A with NLQ £425
Canon PJ1080A (colour) £399
Epson P40 .... £95
Epson RX80 .... £249
Epson RX80FT £299
Epson FX80 .... £389
Epson FX100 .... £529
Epson DX100 Daisywheel £475

Daisy Step 2000 .... £250
Shinwa CP80 (Centronics) £215
Shinwa CP80 (RS232) £239
Commodore 1520 p/p £99
Commodore MPS801 .... £215
Alphacom 32 .... £60
MCP 40 .... £129

DISK DRIVES

Sinclair Microdrive £49
Sinclair Interface 1 .... £49
Sinclair Expansion System (inc. Microdrive/Interface 1/Tasword Two/Masterfile/Ant Attack/Games Designer) £99
Commodore 1541 .... £219
Torch Disk Pack £800
Memotech (Single) £439
Memotech (Dual) £609

Cumana (single without PSU)

CSX100 100K 40T £119
CSX200 200K 80T £155

Cumana single with PSU

CS100 100K 40T £145
CS200 200K 80T £181

Cumana (twin drives with PSU)

CD200 2x100K 40T £261

SPECTRUM PERIPHERALS

CASSETTE RECORDERS

DESKS

AMSTRAD

SPECTRUM

Range of programs available for MTX, BBC, Electron and Amstrad

Please order stating (1) Programs required; (2) Computer; (3) Amount enclosed; (4) Name & Address.
All prices include, packing & VAT. Overseas orders welcome.

BEGINNERS first bytes

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

I could do that...

The problem for December's competition was to write a program which played noughts and crosses. Still pursuing the theme of artificial intelligence, we also suggested that you might give the program the capacity to learn from its mistakes.

The winning program — for the BBC — came from S. O'Grady, 29 Linden Gardens, London W2. It does not include a learning facility but then it does not need to — the program never loses. Admittedly, managing to win or draw every time at noughts and crosses is not difficult.

We were impressed, however, by how short the program was. It uses the evaluation function described in David Levy's book, *Computer Gamesmanship*. This involves examining each possible move and counting the number of noughts or crosses in each horizontal, diagonal, and vertical row.

Line 230 then works out a score according to the formula: S=N3*128 — C2*63 + N2*31 — C1*15 + N1*7. N3 contains the number of rows of three noughts, C2 the number of rows of two crosses, and so on. The computer, which is playing noughts, makes the move with the best score.

If you do not have a BBC you should be able to convert the program fairly easily. MCD3 in line 50 gives the remainder when a number has by then divided

(continued on page 29)

High-level languages

Last month's First Bytes showed why operating systems are necessary: they handle all the boring housekeeping functions on a micro, and generally keep it ticking over. Thanks to them, the micro is your obedient slave, just waiting for your commands.

But to get your Spectrum or Commodore 64 to leap through hoops you need some way of telling it exactly what to do. This is where high-level languages come in.

They are called high-level because humans can understand them, more or less, and it is a well-known fact that we are higher beings. Low-level languages are things like machine code that only freaks who think in hexadecimal can cope with.

A high-level language is a computer language that uses a series of statements that look a bit like English, and whose rules — the "syntax" of the language — mirror those of everyday speech. In this way the whole business of programming becomes much more straightforward.

The most famous high-level language is of course Basic. Basic is so common that people tend to forget that it is only one of many ways of talking to your micro. Not only are there numerous other high-level languages, but also a whole range of progressively lower levels you can interact with a machine.

Basic stands for Beginner's All-purpose Symbolic Instruction Code, and was developed 20 years ago with the specific aim of creating a language that was reasonably close to English, and hence could be taught to beginners.

It uses simple words like If, Then, Do, Goto, together with the usual mathematical operators like + and -. Each line of the program contains one or more sets of commands written using them. After a program has been written, it is then run.

The idea of running a program is something else we tend to take for granted, but is a key ingredient in developing advanced and powerful software.

Some high level languages,

including Basic, allow you to enter a command which is obeyed immediately. This is fine for very simple calculations, but does not let you move on to more complicated problems.

In fact, programming languages do not always have this immediate mode of execution. For example Fortran, short for Formula Translation, can only run complete programs after they have been fully built up. In appearance its programs look very similar to ones written in Basic, which is hardly surprising since Basic was partly based on it.

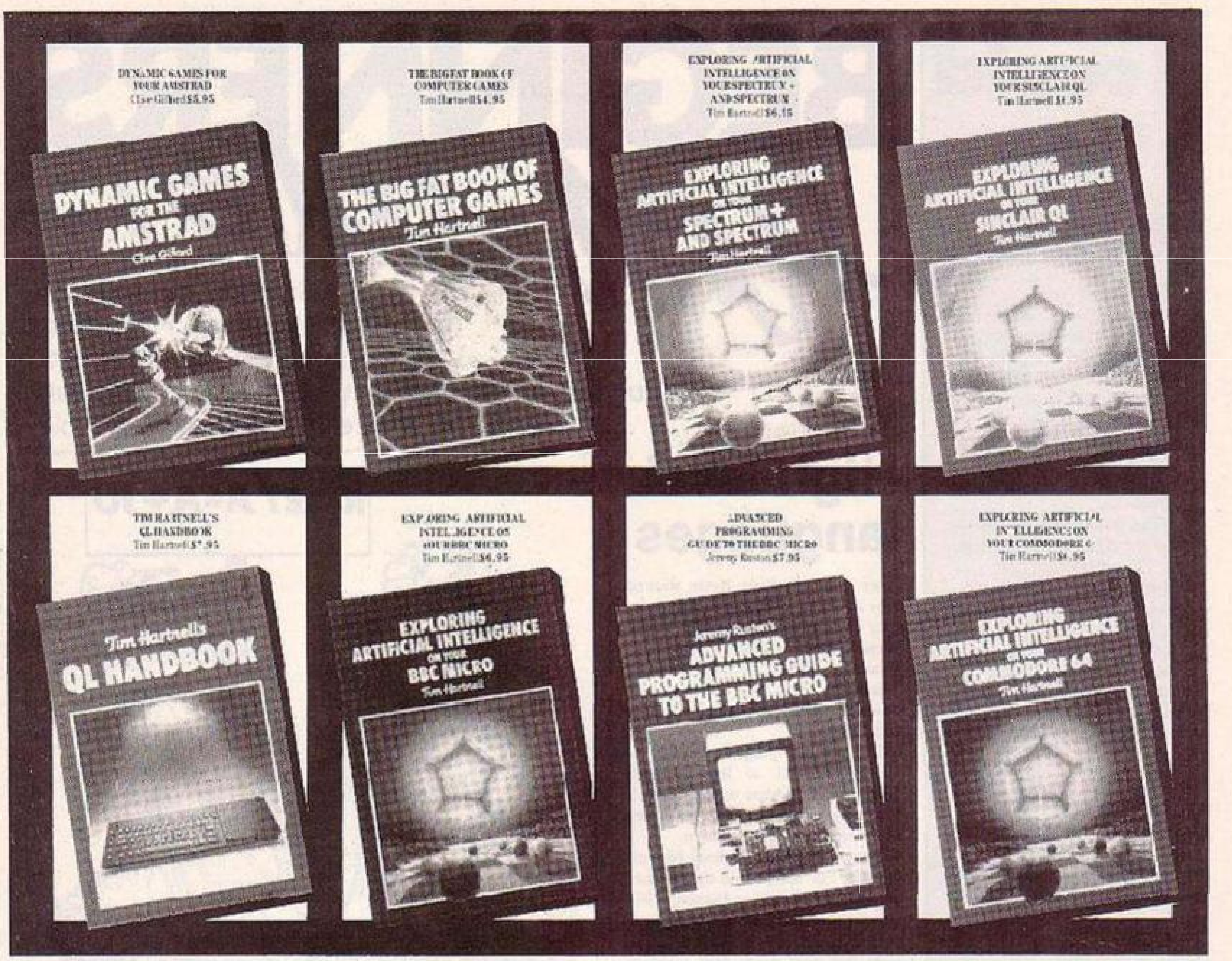
There are minor differences of syntax, but it is easy to move across if you know Basic. Fortran is used mainly for heavy number-crunching applications in science and engineering, and so is not often found on micros.

Another language in the Basic stable is Pascal, named after the French mathematician. It came about from trying to design a high-level language that would have all the advantages of Basic without some of its less desirable features. Advantages included that it was easy to learn and understand. Its less desirable features included the dreaded Basic Spaghetti Syndrome.

Anyone who has written Basic programs knows the temptation. When you find that your program does something unexpected, or has missed out a particular case, or needs modifying, you don't go away and write a whole new program. Instead you add a Goto or two.

This often works very well. Unfortunately it can leave the logic of your program as tangled as a plate of cold spaghetti — hence its name. This means that when you come to look at your program again in a few months' time, you cannot for the life of you work out how it is doing what.

(continued on page 29)



EIGHT NEW BOOKS FROM INTERFACE

There's everything you need to be dynamic, advanced, intelligent and fat!

The latest books from Interface Publications Ltd are determined to put new skills at your programming fingertips –

For instance:

If you're the dynamic type and you own an Amstrad, what could be better than our latest title "DYNAMIC GAMES FOR THE AMSTRAD"?

On the other hand, if your mind is far in advance of other earthlings . . . don't despair.

"ADVANCED PROGRAMMING GUIDE TO THE BBC MICRO" and "THE QL HANDBOOK" will stretch your imagination still further.

But where do you turn if your computer is giving you dumb answers? look at our "EXPLORING ARTIFICIAL INTELLIGENCE" series for the SPECTRUM – and SPECTRUM, the COMMODORE 64, SINCLAIR QL and BBC MICRO.

The mind will boggle!

We even have a new book for readers who think BIG.

It's called "THE BIG FAT BOOK OF COMPUTER GAMES" – for practically any micro.

All these new titles are written by the country's most respected computer authors . . . Tim Hartnell, Clive Gifford and Jeremy Ruston.

So don't despair if other books have left you feeling lethargic, jaded and hungry . . .

. . . go along to your local bookshop and let these eight new Interface books give you a "pick-me-up".

See them at all good bookshops or computer stores or write to:—

Interface Publications Ltd. (8YC)
9-11 Kensington High Street,
London W8 5NP.

Name: ....

Address: ....

....

....

Please send me the following books.

....

....

I enclose remittance in full.

Interface Publications Ltd

Interface Publications are distributed exclusively in the UK and Eire by WHS Distributors, St John's House, East Street, Leicester (0533) 55:196.
Export orders handled by Interface Publications Ltd.

BEGINNERS
first bytes

(continued from page 27)

Pascal aims to stop this sloppy kind of programming. One of its tricks is not to have a Goto at all. Instead you must break up your program into neat and logical smaller units. Pascal is also very strict about saying what kind of variables you are working with — integer, real, and so on — and won't let you pluck them out of the air as in Basic.

All-in-all, Pascal is designed to encourage good clear programming habits in a high-level language. It is becoming available on an increasing number of home micros. So if you feel like a little discipline, it could be for you.

Another language that is beginning to appear is Forth. This was originally designed to control the movements of an astronomical telescope. It is still mainly used today for such control applications, especially things like robot arms.

Like Basic, Forth can respond immediately to a command or to built-up programs. One of its most powerful features is the ability to create new commands in the language as you go along. Whereas in Basic you are stuck with those that the designer thought fit to stick in, in Forth you use the fundamental commands to write new ones for your particular needs.

One slight disadvantage with the language is the way in which you write out mathematical operations. Because it was developed for specialist applications, the designer didn't worry too much about little oddities. One of these is the fact that you use what is called Reverse Polish Notation.

Effectively this means that all the numbers and functions are bunched together at one end of the line, and all the operators that act on them at the other. The way they interact together requires a certain amount of mental acrobatics.

If you wish to retain the ability to create your own functions and operators without having to sacrifice all the legibility of Basic, you could try something called APL.

This stands for simply A Programming Language. Like Fortran it has a strong mathematical bias to it, and it is very useful for writing one-line programs that carry out complex calculations very quickly.

One problem with most versions of APL is that they use a large set of extra signs that make an APL program look like Ancient Egyptian hieroglyphics. This also means that you really need a special keyboard too. Which is a bit of a joke when you consider that some micros like the Spectrum haven't even got an ordinary keyboard.

Happily a version has recently been launched for the QL that replaces all these symbols by simple words. The combination of the QL and APL creates one of the most powerful micro number engines around.

All the languages so far considered have been geared towards the processing of numbers. But another class of high-level languages is concerned with lists and rules.

These are languages that are beginning to produce significant progress in the trendy field of Artificial Intelligence. One that is available on several home micros is Lisp.

Its name comes from LISt Processing. It works by manipulating lists of things rather than simple numbers. Used properly, it can make deductions from associated lists of information. Another language that is used in this field is Prolog — Programming in Logic. A version called MicroProlog is just starting to come through, and offers the same possibilities of trying out programming in AI.

There are many other high-level languages in use today, and they are still being written. As home micros get more powerful and with bigger memories, so the range of options increases. Memory is an important factor because a language is just like any other program in that it needs space to store it in order to run it. For this reason many home computers put their Basics on a Rom chip. This saves valuable space, and allows the language to be used with the full Ram of the machine.

Micros that can talk

Micros are pretty wonderful beasts, but they can be rather anti-social. After all, spending hours bent over a hot keyboard as your eyes go square from staring at the TV is hardly the best way of communicating with your fellow men and women. Yet potentially the micro could be the cause of a communication revolution.

Anyone who has used a mainframe computer at a university or in a big firm knows that much time is spent passing messages from terminal to terminal. Now wouldn't it be great if you could do that with your micros? All you need is a bit of wire to connect you up, except that really you would need bits of wire from you to everybody, and so would they.

Rather conveniently, this network of wires up and down the land already exists. It is called the telephone. All you have to do is to find some way of getting your computer to talk down it. The device used to do this is called a modem.

An obvious way is to convert the signals inside a micro into some kind of audible sound. The telephone can then carry this in the normal way. A modem incorporating something called an acoustic coupler is used for this purpose.

This translates the 0s and 1s that go to make up a computer program into two distinct frequencies. In this respect it is like Basicode described in October's First Bytes. These are then fed down an ordinary telephone headset by plugging it into special rubber sockets on the acoustic coupler. A similar acoustic coupler is used the other end to decode these two tones back into the machine readable binary digits.

Although simple in theory and fine in principle, there are one or two very obvious difficulties with this method. First, if the headset is disturbed while data is being sent there is very likely to be corruption of the audio bleeps and hence the information sent. Secondly, the whole system of using very fast changes of frequency — about 300 per second — is fraught with similar dangers.

Far safer is the direct connection modem. This allows you to plug your micro directly into the telephone system. After the modem has done some discreet preparation of programs to be sent, they can then be downloaded directly. This is both less likely to suffer from data corruption and potentially much faster.

There is the slight problem that British Telecom is understandably concerned about what you might shove down its precious telephone lines in this way. Direct connection modems are therefore subject to pretty exhaustive scrutiny by the British Approvals Board for Telecommunications.

It is illegal to connect a modem to the network that has not been approved. Approved models carry a round green sticker; models that are not approved must say so by carrying a triangular red sticker.

Naturally, approved modems cost more — the cheapest is about £100 against £50 for an unapproved model. But do not be tempted to cut corners. BT periodically tests telephone lines.

Besides, there is no real point. A few years ago, a modem would have cost several hundred pounds at the cheapest. Today, the £100 barrier is being breached all the time for most popular home micro models, and prices are still dropping. You can even get autodial models for this sort of price. These are rather civilised devices that will even dial the number for you.

I could do that...

(continued from page 27)

by three; while DIV3 returns the number of times three divides into another number. X = 8 MOD3 could, for example, be replaced by X = 8 − 3*(INT(8/3)). You may also need to replace the Proc statements by Gosubs.

For this month's competition the £15 prize will be awarded to the program with the most interesting bug or bugs. Quality is more important than quantity here: we are looking for those maddeningly elusive bugs that keep you up half the night. The program should not be more than 20 statements long, and should be accompanied by a note telling us what it is supposed to do.

If you have anything of interest to tell us about your computer club why not contact us on 01-661 3144.

Local news

Irvine

You can make contact with the Irvine hackers via Ewan Dalton, 21 Berry Drive, Irvine, Ayrshire KA12 0LG or telephone 0294 7657. Membership costs £2.

Whitehaven

The West Cumbria User Group serves the Whitehaven and Workington area. Activities include open evenings, computer courses and working on various projects — including speech synthesis, digitising graphics and a lightpen. Ring P Majid on 0946-62732 or K Purkiss on 0946 66586.

Gravesend

The Gravesend Computer Club now hangs out at the Council Tenants Club, Whitehill Lane, Gravesend, Kent. They meet every Thursday evening. Contact The Club Secretary, 58 Apsledene, Hever Farm Estate, Singlewell, Gravesend, Kent DA12 5EE.

Colwyn

Colwyn Computer Club meets at the Greens Hotel, Colwyn Bay. Contact D Eevan, c/o Abergele Road, Colwyn Bay, Clwyd LL29 7PA.

COMPUTER club

Paul Bond takes a trip to the banks of the Thames to discover what the besieged GLC is doing micro-wise.

To be or not to be? Shakespeare may not have had the Greater London Council in mind when he penned these immortal words — but there is inevitably an element of doubt whenever one writes about a body linked with the GLC, subject as it is to such a withering onslaught from the central government.

David Kimpton put it this way with regard to the GLC Computer Workshop, of which he is head: "No-one has tried to identify functions which should not continue". The functions are certainly many and varied. The famous Room 97 — it is now just called the Computer Workshop — provides a chance for people to try out various types of personal computer. It is occasionally booked by London-based computer clubs like the Association of London Computer Clubs, BASUG, and the Independent Commodore Products User Group (ICPUG) — but it also provides seminars and workshops for voluntary organisations, community groups, trades unions, co-operatives and professional associations.

The premises opened in February 1982, and Mr Kimpton's job was originally to look after information technology (IT — remember that?) and the GLC. They kicked off by sending out a survey via the London Voluntary Service Council which has a list of the 5,500 voluntary organisations in the capital. Since then they have built up equipment, expertise and increased staff resources to 10.

Organisations which have received help include Age Concern Greater London, British Sports Association for the Disabled, the National Jazz Centre, the London Union of Youth Clubs, and various Family Service Units. In the last six months they have held 58 seminars, advised over 100 individuals and dealt with over 200 delegates from disabled organisations. These include co-operatives like the Collective Design and Building Co-operative and the Half Moon Theatre.

Systems advised on include everything from dBase II on a Televideo — as used by the Mental Health Foundation to build up a directory of caring agencies — down to the less recherché BBC Micro used by FLAT (Facility for Living & Assessment Together). FLAT is a small registered charity set up to provide training in self-help skills for mentally handicapped people in the London Borough of Southwark. The BBC is used as an administrative tool for budgeting and cash-flow analysis, and providing training sheets — each FLAT trainee has a planned training schedule — and mail. It is envisaged that the computer will eventually become a training aid using basic educational games. A BBC with a database Rom is also being used by Unity 70, an organisation for handicapped children.

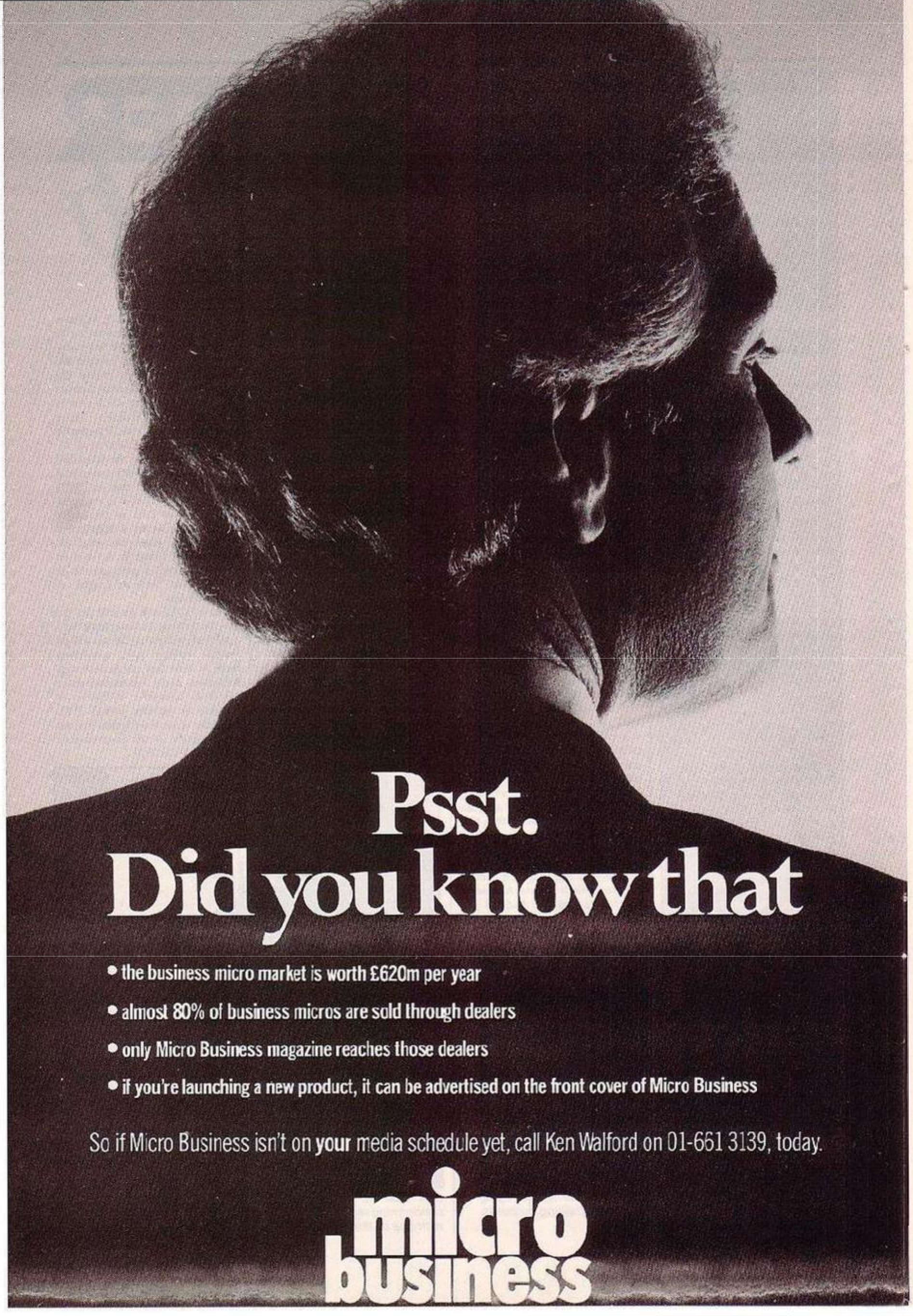
The GLC Computer Workshop doesn't just provide help for caring agencies — for example, some advice has been given to Fantasy Factory Video, a non-profit making organisation which is compiling a database list of all existing commercial and educational videotapes. The Workshop also maintains contact with groups like Microsister and Central London Women & Computing which provide resources for women using computers. The latter organisation can be contacted on 01-430 0112.

During the summer the Workshop developed a Braille word processor at considerably less cost than the £5,000 that existing specialised systems can cost. This was done by the simple expedient of placing a high-quality racing bicycle inner tube over the printer roller. Braille is all based on six dots arranged in pairs like the six on a dice-face. These are printed out by the full stop.

The GLC has put £30,000 into the London Festival of Computing held April 9-21, and hopes that this will go towards making more Londoners aware of what they can achieve with computers. More information about the GLC Computer Workshop is available by phoning 01-633 3592. Enquiries about the London Festival of Computing should be directed to BIPR on 01 734 2997.

Central London Women & Computing's Rachel Sarger using one of the six Apricots that CLWC have for training purposes. They are funded by the GLC.

Last year the GLC ran a competition for a computer game condemning racism. Here Ken Livingstone is seen zapping away with one of the winners.


Psst.
Did you know that
• the business micro market is worth £620m per year
• almost 80% of business micros are sold through dealers
• only Micro Business magazine reaches those dealers
• if you're launching a new product, it can be advertised on the front cover of Micro Business
So if Micro Business isn't on your media schedule yet, call Ken Walford on 01-661 3139, today.
micro business

ADD-ON EXTRA

Opus

Disc System
Spectrum
£199.95

Opus have released a disc system for the Spectrum which they claim is totally compatible with the Microdrive operating system. This means that any program which runs on a Microdrive will run on an Opus system, at a much higher speed. The Spectrum sits on top of the metal interface and can be screwed into it, like Interface 1.

Apart from the Shugart disc socket there is a bi-directional centronics type printer port and a continuation of the expansion bus. The full range of Opus drives, three or 5¼ inch can be used. The system comes with a utility disc and a manual.

The manual is perhaps its only major failure as it rather assumes you know how to use a Microdrive. Still, you can always buy one of the many "drive your Microdrive" books. It represents excellent value at £199.95 for the complete system and is available from Opus on 01-701 8668 or from larger branches of Boots.

Euromax

Joystick Interface
+4 and C16
£4.45

This is a useful add-on for C16 and +4 owners, giving them access to the huge range of Atari-type joysticks available. This includes Euromax's own range.

Interpress

Cassette Storage
£6.00

The Boneco Audio Cassette Safe can store up to 10 cassettes in a sliding draw. Several draws can be clipped together. The cassettes are stored vertically.

Euroelectronics

Printer Interface
Spectrum
£34.95 + cable

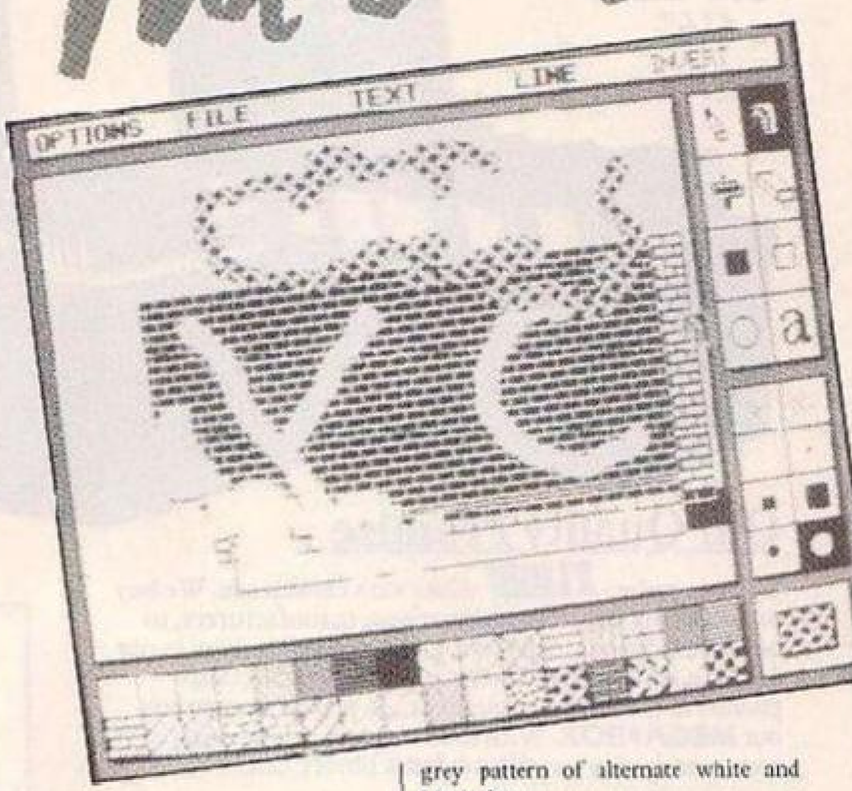
For those lucky enough to have one of the new colour printers, this interface allows full colour or four colour screen dumps.

HARDWARE hitlist

AMX mouse

BBC
Advanced Memory Systems
£89.95

By introducing paste-over windows, icons and, most importantly, a mouse, Apple's Macintosh almost allows you to bypass the keyboard as a means of operating the computer. When it appeared people predicted that it would only be a matter of time before the same features appeared on an 8-bit micro. Island Logic kicked off by using windows and icons in its excellent music program. And now Advanced Memory Systems has gone one better by adding a mouse to the BBC.



A sensitive joystick

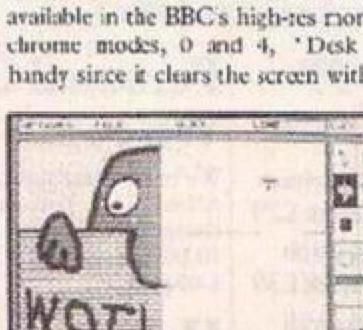
On its own the mouse is not much more than a very sensitive joystick or an upside down trackball, scaled down to fit snugly into the palm of the hand. It connects into the user port and needs a flat surface on which to roll around. What gives it its power is the accompanying software.

The AMX mouse comes with a Rom and several programs on cassette or disc. The Rom provides 15 commands which can be included in Basic or Assembly language programs. Together they allow you to use the mouse to control pointers, windows and icons.

Icons are built in

Sixty four predefined icons, each made up of four characters, are built into the Rom. *Icon places the icon of your choice where you want it on the screen. Alternatively you can assign a particular icon to act as the mouse pointer. Then with the command *Movepointer you can use the mouse to move the icon around.

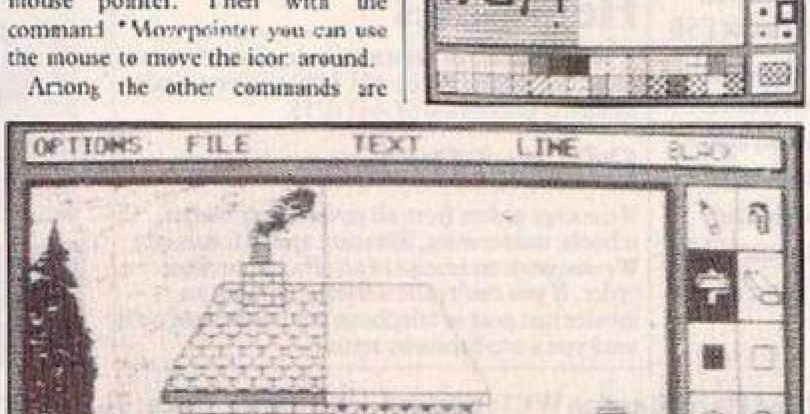
Among the other commands are *Window which draws a window with a border and *Button which defines the key codes generated by the three buttons at the front of the mouse. As the commands are only available in the BBC's high-res monochrome modes, 0 and 4, *Desk is handy since it clears the screen with a grey pattern of alternate white and black dots.



Just how effectively these routines work with the mouse is well demonstrated by the ArtworkX program. It is clearly modelled on the Apple's Macdraw program. Although it is not as powerful it must be one of the most impressive drawing programs yet to appear on a home micro.

To start off you are presented with a blank screen bordered by a number of boxes which show the options available. Eight icons at the right represent such facilities as a spray can, a pencil, a rubber, and a paint roller. If you want to use the spray can, you move the mouse pointer over the icon and highlight it by pressing a button.

Now you can choose a spray size and, from a range of 24 patterns, a spray texture or "colour". The mouse pointer changes into a spray can and by simply rolling the mouse around your desk top you can create the sort of effect favoured by subway graffiti artists.



A window pops up

When you highlight one of the headings along the top a window pops up giving a further range of options such as dumping the screen to a printer or including text in the picture. The mouse makes all these facilities exceptionally easy to use.

A standard reproach levelled against drawing programs is that they do not improve on pencil and paper. ArtworkX — in conjunction with the mouse — is one program that refutes this charge. Indeed this reviewer was hampered by requests to play with it from people who normally give computers a wide berth.

The original and still the leader in value.

MEGA•BOX measures 6¼″ x 8¾″ x 6½″

Our Quality Promise

You can order **XLtron** disks with confidence. We buy our disks in bulk from international manufacturers, to our specifications, then test, grade and retest them in our London laboratories. Every order of 25 or 50 comes packed in the same top quality rigid plastic storage box, our **MEGA•BOX**. With four dividers. Every order of 10 comes packed in our **disco·box** library case.

Fully Guaranteed

The **XLtron** quality control is so stringent that we can give our famous 'two for one' guarantee. If you find a faulty disk, return it to us, and we'll send you two in exchange immediately. All part of our five year guarantee.

XLtron 5¼″ Floppy Disks Prices

Code 3 25 ss/dd **XLtron** 5¼″ 48tpi disks with **RHINOKOTE** in **MEGA•BOX** £29

Code 4 25 ds/dd **XLtron** 5¼″ 48tpi disks with **RHINOKOTE** in **MEGA•BOX** £39

Code 5 50 ss/dd **XLtron** 5¼″ 48tpi disks with **RHINOKOTE** in **MEGA•BOX** £50

Code 6 50 ds/dd **XLtron** 5¼″ 48tpi disks with **RHINOKOTE** in **MEGA•BOX** £75

Code 1 10 ss/dd **XLtron** 5¼″ 48tpi disks with **RHINOKOTE** in **disco·box** £13

Code 2 10 ds/dd **XLtron** 5¼″ 48tpi disks with **RHINOKOTE** in **disco·box** £18

Features: Write protect notch, centre hubs, double and single density.
Tyvex® sleeves, and with **RHINOKOTE** ©.

With RHINOKOTE – it's tough!

Personal Callers Very Welcome

We're now established in our new showroom in Alfred Place. You can save our £2.00 delivery charge by calling in – you'll be welcome from 10.00 a.m. till 5.00 p.m. Saturday 10.00 a.m. – 4.00 p.m.

Help Lines

If you want help or information to place an order ring our 'hot line' on 01-631 3600 or if you need technical advice ring 01-631 0255.

Official Orders

We accept orders from all government bodies, schools, universities, libraries, armed forces etc. We despatch on receipt of an official purchase order. If you can't raise a cheque without an invoice just post or telephone your order and we'll send you a pro-forma by return.

NEW! The midi·box

15 ds/dd disks in our **midi·box** at a bargain price.
Our new **midi·box** has some great features. It's made of high impact PVC and holds up to 30 5¼″ disks, but is one of the neatest on the market. Measuring 6¼″ x 6¼″ x 3¼″ the ridged lid conveniently holds the disks you are working on ready to hand. And with 15 ds/dd disks with **RHINOKOTE** it's a bargain at only £20 plus VAT. Code M1.

A Box and a half for the price of one!

Special. Midibox with 80 track 96 tpi disks at only £25 plus VAT. Code M2

Disco Tek Ltd., Lex House, 3-6 Alfred Place, London WC1, England. Telephone Sales: 01-631 3600 Technical Enquiries: 01-631 0255

Fill in the coupon or send written orders.

Name____________

Signature____________

Address____________

____________ Postcode______

I enclose a cheque for £______ or debit my Access/Diner card number

____

Disco Tek Ltd., Lex House, 3-6 Alfred Place, London WC1, England.
Please send me the following:

Code No.	Quantity	Product	Computer	Price
			VAT at 15%	
			Delivery	
			Total	

Add £2.00 delivery for disks, £5.00 for drives or £6.00 for both. Cleaning kits free delivery.

Star★chart

Blue Max

CBM-64
£8.95
Shoot-'em-up
U.S. Gold

★ ★ ★

Blue Max flies again — but this time with Commodore markings. With its impressive graphics, this U.S. import first appeared in Britain for the Atari some 14 months ago. The screen display and sound are not as good as the Atari's.

You have to strafe and bomb ground targets — bridges, factories, boats, and artillery batteries — and shoot down enemy aircraft.

Although the setting is World War I, you are flying for the RAF at a time when only the RFC existed and are pitted against the Axis powers of the 1930s.

Yet those academic objections don't detract from what is a very good game.

New Cylon Attack

Spectrum 48K
£5.75
Shoot-'em-up
A'n'F Software

★ ★

In isometric perspective — 3-D to you, mate. This is what it says on the inlay, but I'm not convinced. No swopping through cosmos like Codename MAT.

You just stooge about left and right, up and down, peppering the oncoming hordes with laser bolts. Not very colourful, not very 3-D.

Zone 00

Spectrum 48K
Blow-'em-up
Allanson

★ ★

One of these games where you have to dodge around planting one bomb at a time to destroy your assailants. These include octopi chasing you round shipwrecks that look like Blue Peter badges, and later on yellow submarines and blue meanies.

SOFTWARE Shortlist

QL Chess

- *Sinclair QL*
- *Psion/Sinclair*
- *Board game*
- *£19.95*

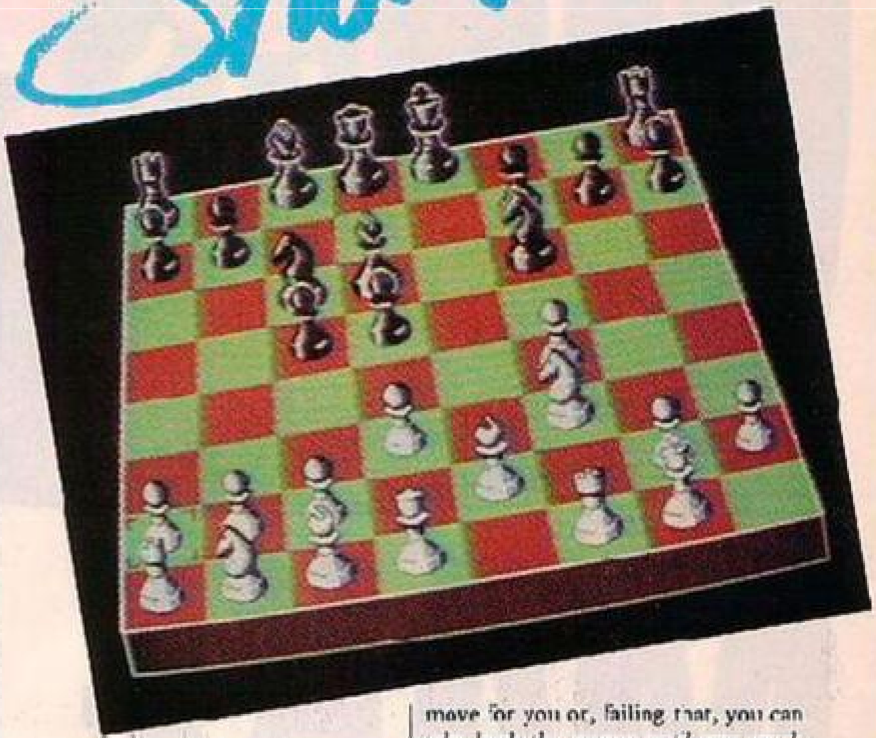
★ ★ ★ ★ ★

As Karpov and Kasparov, toe to toe under a chessboard, were still slogging it out in what was to become the longest-ever world championship match, Psion was preparing its world-beating chess program for the commercial arena.

Although the Psion program was running on a 8MHz Sage computer when it tied for first place in the 1984 World Microcomputer Championship, its performance on the QL is still very impressive. Its strengths lie a lot deeper than the novelty of the program's three-dimensional graphics.

You should be able to find a level of play from one of 14 that will give you a good game. Those 14 levels can be doubled to 28 with the use of the Easy command — which puts the QL at the disadvantage of not being able to think about its move while you are thinking about yours.

If you really want an easy game, try the novice level 0. The computer will benignly play weakly whenever it looks like beating you. Of course that kind of help may not appeal, so the human can choose a response time from the QL which can vary from a few seconds at the lower levels up to level 12's equal time — it averages out



the time you are taking to move and then matches your pace.

For a game of correspondence chess length, level 13 gives the computer an infinite time to consider its move, and will only make up its mind when you force it to using the M, move now, key. Fans of chess puzzles will savour the Psion program's problem solving ability. It has eight levels.

When things are getting desperate you can ask the computer to suggest a move for you or, failing that, you can take back the moves until you reach the point where you blundered. If you actually manage to inflict a defeat on the silicon opposition you can call round friends and neighbours and bore them with a full-length action replay of your triumph.

But apart from playing a quality of chess never before seen on a home computer, what makes this program immediately attractive is the astonishingly high quality of its graphics.

Toby Wolpe

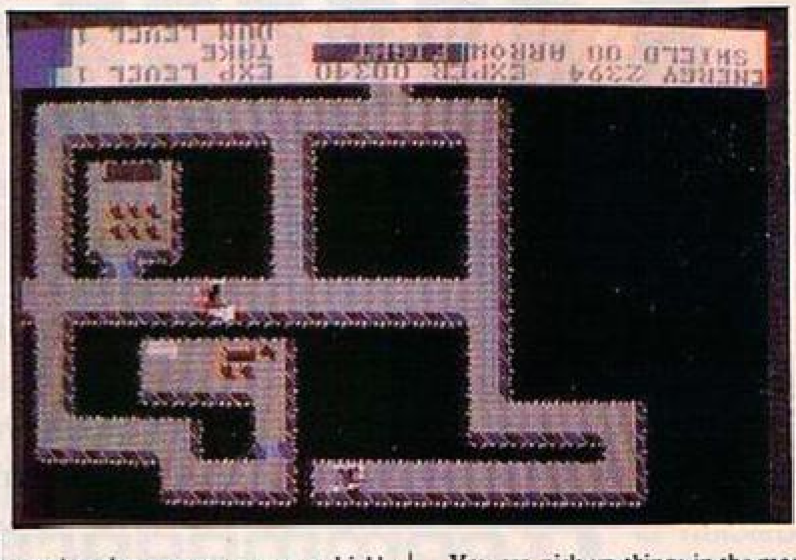
Dungeons of Ba

- *CBM-64*
- *Arcade adventure*
- *Quicksilva*
- *£12.95*

★ ★ ★

Recover the fabled stone of Ba before your energy runs out. This is a maze game with a difference. Norman the warrior has to fight his way through tunnels, pressing secret panels in the corridors to reveal hidden chambers with objects to help him in his quest. This is an arcade adventure which gives you the kind of section through the earth view of the action best exemplified by Dig-Dug — except that there is no digging.

I wouldn't go so far as to describe the graphics as spectacular — this is how they are described on the packaging — but nevertheless you are confronted with a fair range of weird and wonderful opponents from scorpions to assorted bovver boys, presumably the Guardians of the Stone. You can steer yourself around the maze with the aid of a joystick plus the function keys have been redesig-

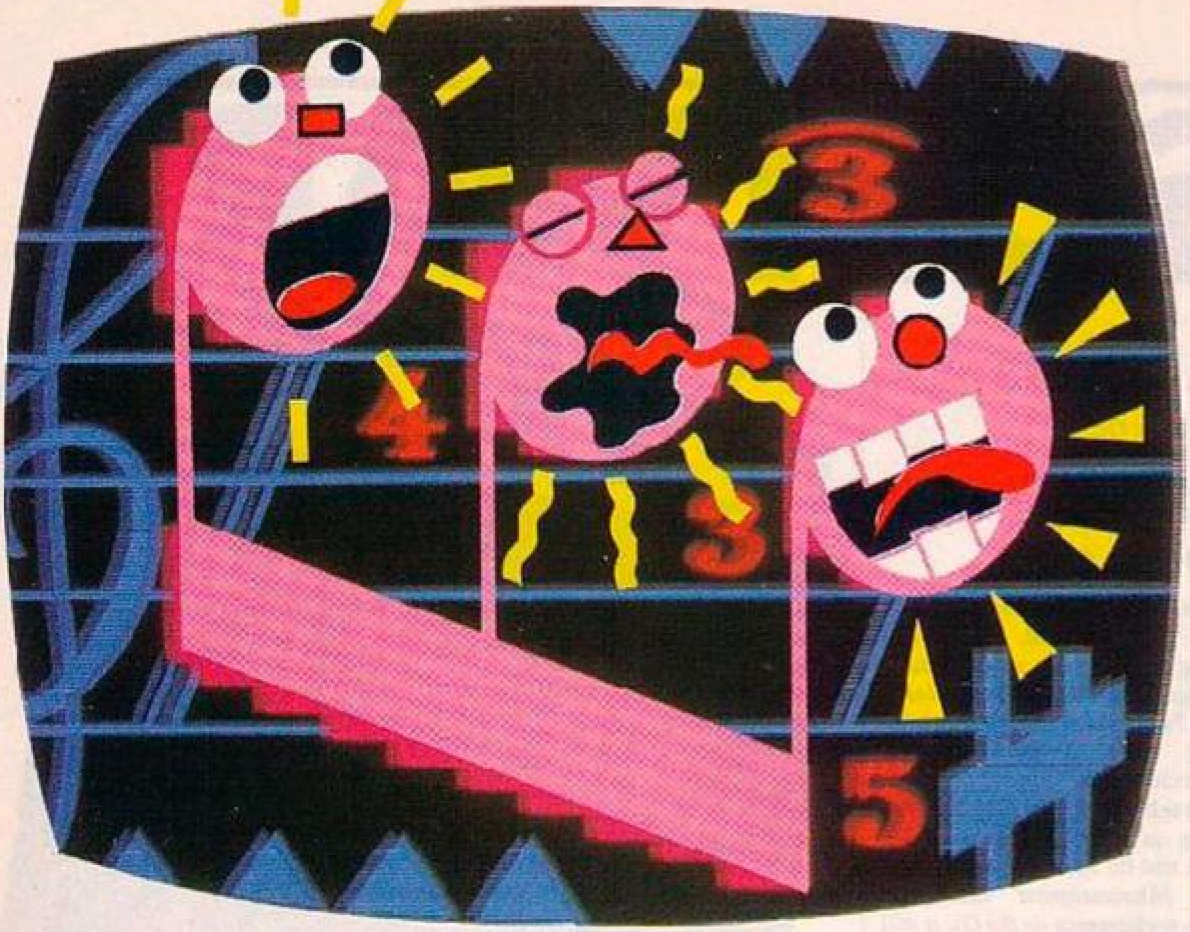


nated so that you can put up a shield, or fire an arrow, fight, or take an object. You simply punch the appropriate key before you squeeze the fire-button.

Shields are necessary because arrows will suddenly zoom down the corridors at Norman, though they don't seem to be much use against the denizens of the maze. If you do enter into fisticuffs with any of these beings the C-64 emits a realistic thumping and whimpering sound. With each contact your experience rating increases and your energy level drops.

You can pick up things in the most unexpected places. It is worth searching the apparently empty rooms which sometimes appear at adjuncts to the maze because you may discover food and drink, more arrows, or even a vial of unknown. This can make you zip around the maze at terrific speeds, or not do very much for you at all.

There are unexpected pitfalls and teleport traps which cause you to be pitched in with the most unpleasant company, the usual thumping and squeaking resulting. All this kind of *(continued on page 37)*



notes all at the same time).

At the press of a button, you can summon up pre-programmed rhythms and bass accompaniments to play along to.

These three rhythm combinations can be speeded up or slowed down.

You can even glissando (so long as you don't hurt yourself.)

That is, make a note slide up in pitch.

You can filter sound: reduce the treble, the bass, or both. You can save, on cassette or disk, a voice or tune for future use.

And, for better sound reproduction, you can connect

MAKE MUSIC YOUR FORTE.

Alright, let's all gather round the computer for a good old sing-song.

You'll find the new Commodore 64 Music Maker strikes exactly the right note, whether you're an accomplished musician or whether you are an out-and-out beginner.

If you can hum and know your ABC, you can start to play famous popular tunes immediately.

No matter if you've never played a note before.

Simply type in the notes from the SFX Tutor Handbook, then tap in the rhythm.

And, before you can even say 'Richard Clayderman', the automatic playback fills the room with music.

Once you've become a 'piano virtuoso', you'll quickly appreciate the Music Maker's other amazing capabilities.

You can synthesize musical instruments, even create your own 'synth' electronic sounds.

You can play notes polyphonically.

(This is the smart way of saying you can play three different

commodore
COMPUTER SOFTWARE

Music Maker to your hi-fi system.

Music Maker has been designed, like all our software, to get the very best out of Commodore hardware.

It's the first in a series of packages which will fully exploit the Commodore 64's outstanding musical capabilities.

Commodore software: it costs no more, even though there's more to it.

MUSIC MAKER DISK OR CASSETTE £29.95.

Star★chart

Cliff Hanger

CBM-64
£7.95
Novelty
New Generation Software

★ ★ ★

Fans of the Road Runner and the unfortunate wolf who tried to ensnare him using wacky devices in those old Warner Brothers cartoons will love this.

You take the part of Cliff Hanger, an inept cowboy trying to stop a desperado by dropping boulders on him, bouncing weights off trampolines, using magnets to pull anvils over cliff edges and so on.

Crude but attractive graphics, great fun.

Paddington's Garden Game

CBM-64
Collinsoft

★ ★

Butterfly collecting Paddington the Bear has to zip around his garden collecting butterflies without being electrocuted by the hedgerow or stung by bees or pricked by hedgehogs.

Like the Magic Roundabout game, this does not really make the best use of its famous character. The somnolent music would make this a good game to play last thing at night as you wind down from a winter's evening zapping over the hostile alien landscape etc.

ATC

Spectrum 48K
£7.95
Simulation
Hewson Consultants

★ ★ ★

Two games for the price of one, though people who bought the previous version of Air Traffic Control are unlikely to rush out and buy this one just for the extra thrill of controlling Schiphol as well as London-Heathrow. It features Concorde and the occasional radio failure and rogue aircraft.

(continued from page 35)

thing results in loss of energy and eventually in your demise. Certainly a competent and enjoyable game, more up to the standard expected of Quicksilva than some other recent releases from that stable.

Paul Bond.

SOFTWARE *Shortlist*

Tir Na Nog

- *Spectrum 48K*
- *Arcade adventure*
- *Gargoyle Games*
- *£9.95*

★ ★ ★ ★

Some old hippies might try and persuade you that Tir Na Nog is an Irish folkband that gained prominence along with Planxty and other unpronounceable names. These people will of course know that the phrase is Gaelic for land of youth. So here we have it, a computer game set in the Celtic Other World. There probably are Irish computer jokes but naturally you won't find any of that sort of thing in *Your Computer*.

Based on the great Irish mythological hero Cuchulainn, the game is billed as a "computer movie". Things being what they are today, it is very difficult for a self-respecting computer game to get into the shops without (a) being based on a movie, or (b) going the whole hog and actually pretending to *be* a movie in its own right.

Tir Na Nog has taken the latter course — the action is presented as though a camera is pointing at Cuchulainn, whom we are assured was known as Cucuc to his friends and intimates. Personally, I would not try calling the shambling knee-jerker at the centre of the screen anything other than Sir unless I had bought him at least three pints of Guinness. If he could play the bass guitar, he would certainly give Motorhead's Lemmy a lot to worry about.

He stands 56 pixels tall — that's pixels, not pixies — and is controlled from the keyboard. The animation of the character is very impressive.

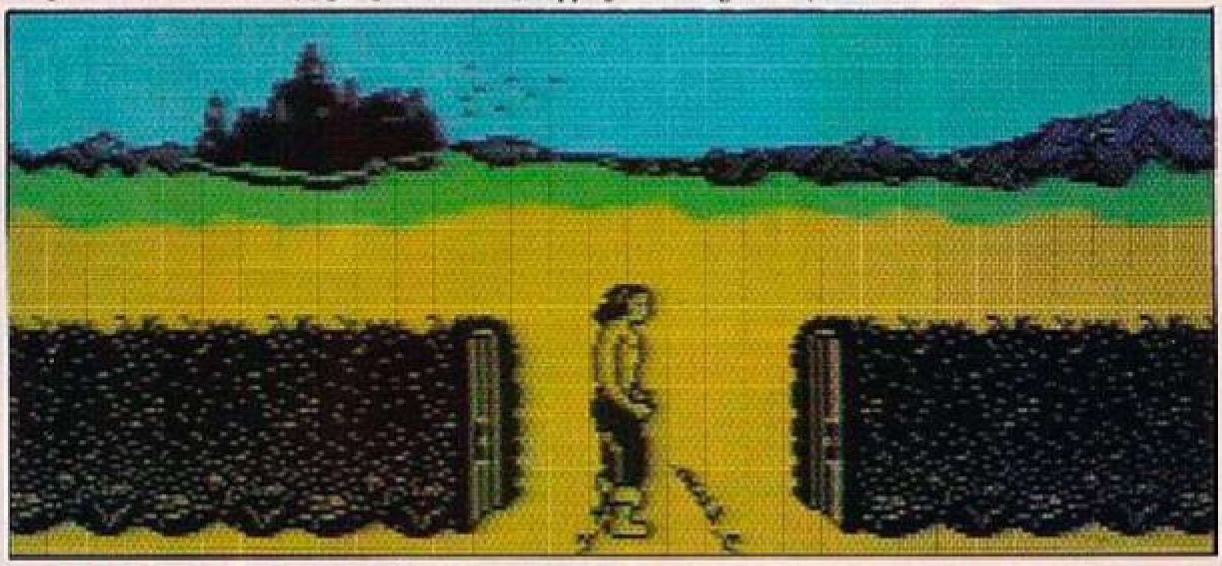
As he slouches disconsolately through Tir Na Nog, the detailed scenery in the fore and middle grounds scrolls past him. Birds of ill-omen hover around the castle of King Dhomnuil, flapping their wings continuously in the distance. Cuchulainn can carry up to four objects — though you have to check with the status area at the bottom of the screen to see what he is actually carrying.

Since everyone in the Celtic Other World is actually dead all you can hope to do is daunt them a little bit, and should anyone harm Cuchulainn seriously he just rematerialises at the entrance to Tir Na Nog — sans objects.

The purpose of the game is to locate and re-unite the fragments of the seal of Calum. Due to a breakdown in security, the seal was smashed into four bits by a servant of the Great Enemy, which has made life very difficult for everybody, the Great Enemy now being free to carry on business as usual, snuffing out galaxies, wasting pain and misery on mankind in the customary way.

Having located the pieces you have to persuade the owners to give them up.

Paul Bond.



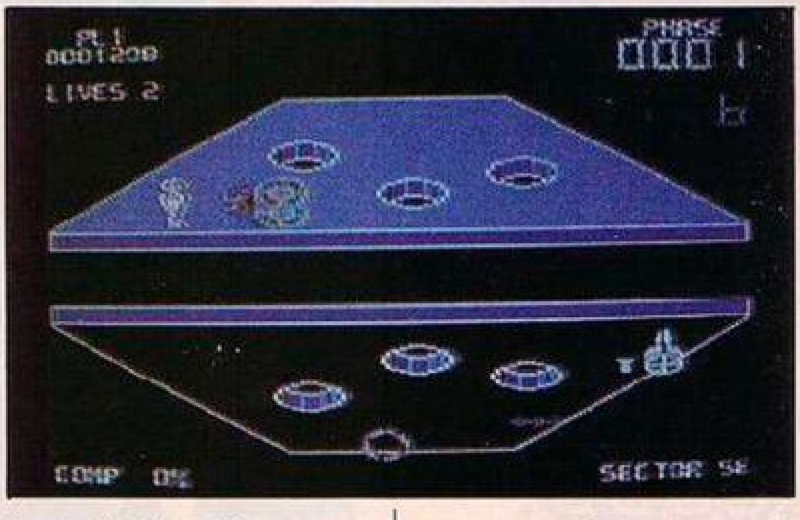
CAD/CAM Warrior

- *CBM-64*
- *Taskset*
- *Shoot-'em-up*
- *£9.95*

★ ★

Not a utility program for computer-aided design/manufacture, but a shoot-'em-up. Perhaps with the role-merging of computer games that has led to such strange offspring as the arcade adventure and the arcade strategy game, we are now seeing the emergence of the arcade utility? Maybe future vidkids zapping away in the arcade will unwittingly be designing more efficient speedboats, aeroplanes or three-wheeled electric cars?

The screen presents you with two sides of a metal plate: the top and the bottom. There are some holes bored in it. You steer a robot around shooting at hostile objects. If he passes over a hole, he flips through to the other side of the plate and carries on doing much the same thing, only upside down. As the game progresses, you are presented with different configurations of plate and more hostiles.



The rather confused introductory pamphlet to the game warns us that as more and more of our environment is planned and constructed by machines, it will fall to the machines to interpret the rules by which we want to live.

Life is definitely out of balance in this scenario. The AI-12 is a machine for generating structures in exhibition halls. It is malfunctioning. Luckily

(continued on page 39)

YOU MARVELLED AT BEACH-HEAD...
NOW ACCESS PRESENT THEIR LATEST MASTERPIECE:
RAID OVER MOSCOW
commodore 64
The most breathtaking 3-D graphics yet seen on the Commodore 64!
Gripping arcade action
Multiple scrolling screens
STATUS: READY
The Soviets launch a nuclear strike against major cities in the United States and Canada. With our own nuclear arsenal dismantled, in accordance with the Salt IV Arms Agreement, the Soviets believe their treachery will lead to total world domination. Our only hope is our space station equipped with stealth bombers, which can fly undetected in Soviet airspace.
As squadron leader, you must lead your commandos on a virtual suicide mission, knock out the Soviet launch sites, and then proceed into the city of Moscow. Armed with only the weapons you can carry, you must seek and destroy the Soviet defence centre to stop the attack! Top multi-screen action!
Available on CASSETTE £9·95 DISK £12·95
BEACH-HEAD
NOW AVAILABLE FOR 48K SPECTRUM £7·95
THE FIRST 64 GAME TO REACH No.1 IN THE CHARTS
Available on CASSETTE £9·95 DISK £12·95
U.S. GOLD
All American Software
U.S. Gold is stocked by all leading computer stores including:
BOOTS WH SMITH JOHN MENZIES
WILDINGS WOOLWORTH
Dealers! For information on how to become a U.S. Gold Stockist write to: CentreSoft, Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Telephone: 021-359 3020. Telex: 337268.

Star★chart

David's Midnight Magic

Commodore 64
£9.95
Arcade
Ariolasoft
★ ★ ★ ★

This old Brocerbund original triumphs over other pinball simulations in its remarkable mimicry of the actual physics of a pin-table. You can charge the strength with which you pull the launch spring.

Psychedelia

CBM-64
£7.50
Freak-out cats
Llamasoft
★ ★ ★

What wakes Jeff Minter up in the morning? His llama clock, of course. Psychedelia is not a game — it's a program which generates patterns on a computer screen. Jeff exhorts us to (a) turn off the lights, (b) put on whatever music you like to freak out to (c) pick up the joystick and do it with feeling. There is an auto-demo, or you can define parameters or call in pre-sets, and you can record about 30 minutes of joystick input in memory. Guaranteed to blow your mind, as they say.

Statix

BBC
£7.95
Novelty
Psion
★ ★ ★

A close copy of Atari's unsung classic, Qix, Statix does not quite get the details right. There is no high score table, and not as much variety as in the original. Still, the game has immense appeal — of the sort guaranteed to grab those who disdain shoot-em-ups.

Superficially it resembles a painter-type game, but with the crucial difference that you are not confined to a grid. The idea is to cordon off 75 per cent of the screen while avoiding the Statix as it flutters around the open territory.

SOFTWARE Shortlist

(continued from page 37)

there is a MAD-2 droid inside it — you must use this to try and find the missing cryo-wafer module which is the source of the trouble. Of course the AI-12 has internal defence systems and this is what your droid is shooting at.

You have to work your way through different levels — a maximum of 8192 screens is claimed but since they are all rather dreary and metallic there is not much to choose between them.

What you have to examine is the actual colour of the plates. All plates on the entry level have a top colour of light blue. There are eight different colour groupings. Different colour groupings have different ways of clearing plates. On some levels you drop time-bombs, on others — shoot to kill.

Every so often you get a chance to jump levels, otherwise the game would be very boring as it admits in the pamphlet.

You are given a rough map, but it covers only one quarter of the entry level. The solution to the game lies in screen 8192 and a large phase counter is provided at the top right of your screen to mark your progress. You are prohibited from entering certain areas without tokens or passwords. You are told where to find the tokens — occasionally — after each completed screen.

Paul Bond.

GO

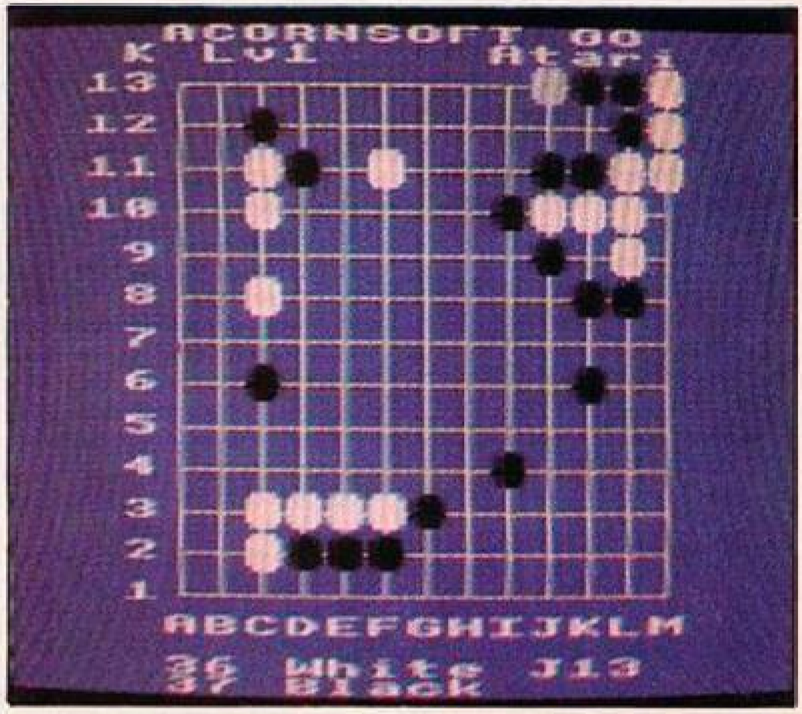
■ *BBC*
■ *Acornsoft*
■ *£9.95*
■ *Board Game*

★ ★ ★ ★

ACORNSOFT'S GO program is a considerable improvement on Edge Computer's version reviewed in the December issue. For one thing it plays on a larger board, 13 by 13. It also plays a stronger game.

In Japan Go is the national board game, played by millions including several hundred professional players. But over here it has yet to really catch on, and the problem most Go players have is finding someone to play with. Which is why a competent home computer version is particularly welcome.

The game is far more difficult to program than chess. Recently, computer board game expert David Levy predicted that even in 10 years' time no program will be able to play Go at anything above beginner level. One reason for this is that the game does not lend itself to the brute force approach as easily as chess. On a full 19 by 19 board strict calculation of the consequences of a particular move is not so important. You could argue that it offers greater scope for intuitive play resting on pattern recognition and a "feel" for the position.



In view of this it is not surprising that Acornsoft Go is better at tactics than strategy. The program tends to get bogged down in securing a small group of stones when there are larger gains to be made elsewhere.

Nonetheless most beginners will find it hard to handle. As well as a handicap option, there are two levels of play and it is quick to move at both.

Simon Beesley

Castle of Terror

■ *Commodore 64*
■ *Melbourne House*
■ *£9.95*
■ *Adventure*

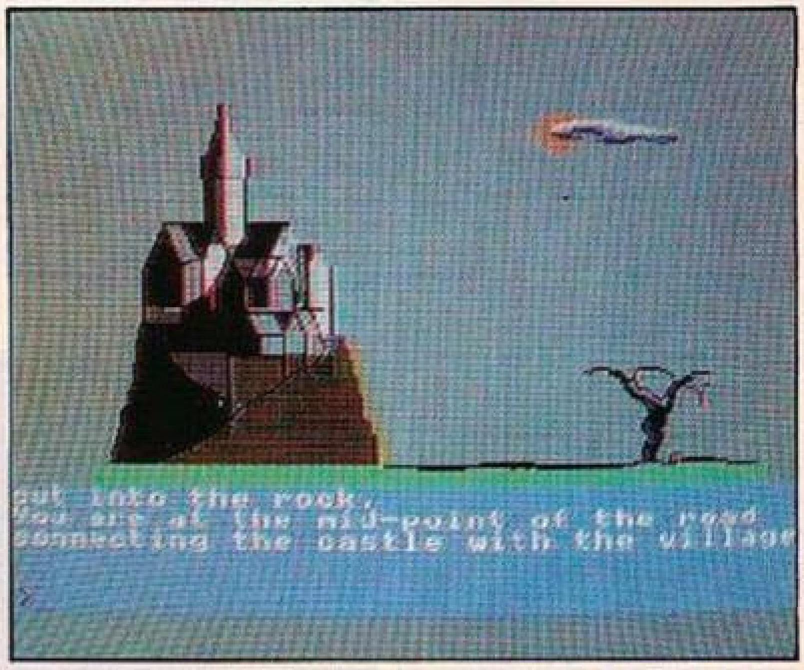
★ ★ ★

NO MAN HAS ever returned from the Castle you are informed by an old man in a pub. The reaction of any sensible person to this news would be to put as much distance as possible between him and said Castle. But, adventurers being what they are, off you go, pausing only to grab any likely looking objects you find lying around the place.

The game is in two sections, the first is played in the village. When you think you're ready to tackle the castle you have to load the next section.

Success depends on persistance and close examination of the pictures.

There are 40 graphic screens altogether with accompanying eerie music. The program is rather fussy about accepting words, but does allow you to enter sentences so that you can skip several screens at once.



Your ultimate quest is to vanquish the evil Count, rescue the beautiful young maiden and with a bit of luck line your pocket in the process. Instant death — naturally enough — lies around every corner.

Lee Paddon

(continued on next page)

Star chart

Tristan and Isolde

CBM-64
£8.95
Arcade adventure
CRL
★ ★

Will they be playing this one in the foyer between acts at Bayreuth? I doubt it. Originally a German game, this may have lost a little in the translation, but when you consider the sort of trouble that people have gone to in actually using real mythology in games like Tir Na Nog, this one does little justice to the Ring Cycle. You pilot a little man through rooms and he gets eaten by monsters. Incidentally since the central characters are Kunibert, the hero and Kunigunde the maiden in distress — not to mention the unlikely Wrumper, the baddie, where do Tristan and Isolde come in?

The Hellion

Oric 1/Atmos
£6.95
Shoot-em-up
Orpheus
★ ★ ★

With 101 screens, this should keep Oric shoot-'em-up fans happy. Your Hellion — mutant wasp — can be moved using the cursor keys, and the baddies fly at you from all directions. A fun game with a nice sense of humour.

MacMan and the Caber Eater

Spectrum 48k
Sinclair
Educational
★ ★ ★

The object of this program is to teach four to eight year olds to add and subtract simple numbers. This is done by multiple choice. It's visually appealing, and the quicker you can come up with the correct answer, the quicker MacMan will build his caber, foiling the dreaded caber eater!

Witch's Cauldron

- *Spectrum 48K*
- *£6.95*
- *Mikro-Gen*
- *Adventure*

★ ★ ★

BUMPKINS OF the world unite. You have nothing to lose but your shape — you have been turned into a toad by wicked witch Hazel. Having failed the auditions for Paul McCartney and the Frog Chorus, it's down to you to seek out and concoct some spells and potions to help you regain human shape.

Witch's Cauldron is a graphic adventure game with a vocabulary of nearly 300 words. You can turn around in a room, getting different walls depicted on the screen, and if you examine things like the GRAMOPHONE very closely, you will find a DIAMOND.

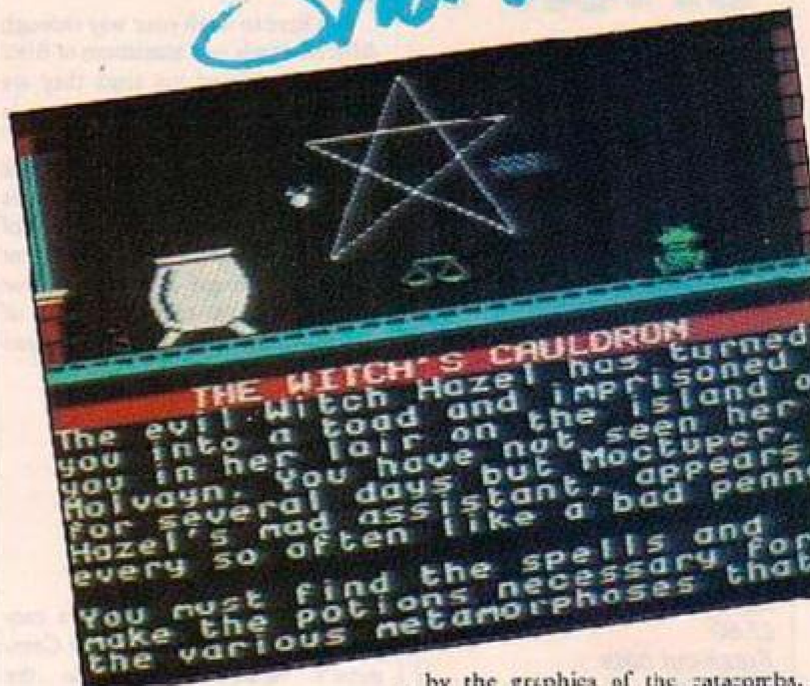
You can't pick up anything that a toad couldn't pick up, which basically means that anything large will have to be left behind. How a toad carries a diamond is a mystery to me — I guess it's okay if no-one gives him a hearty slap on the back. The plus side of being a toad in this game is that you can hop onto things like mantlepieces and examine them. While you can't open any doors you can hop up the chimney.

There is plenty of SOOT here and for your first trick you can throw it over your shoulder. Unfortunately one of Hazel's unpleasant creatures generally happens along and devours you, just as you are about to become more socially acceptable. If you can avoid becoming part of a monster's menu, you have a schedule of about 10 metamorphoses to go through. Talk about getting away for a change!

The program understands plain adventure English; it is possible to give commands like "Put the water in the cauldron".

The game contains over 90 different locations — most are illustrated with a full colour hi-res picture. Not all the objects are useful, and there are supposed to be around 700 different possible actions in the game. Good fun, but you have to remember that one small step for a man is a giant leap for a frog.
Paul Bond

SOFTWARE Shortlist



Gift From The Gods

- *Spectrum 48k*
- *Ocean*
- *£9.95*
- *Arcade Adventure*

★ ★ ★

ORESTES HAS A problem. Mum ran off with another man and then ran off with his kingdom. The only way he can get it back is to enter the Labyrinth.

The Labyrinth, apart from being a tricky place to find your way around is filled with various monsters trying to sap our hero's energy. Fortunately he has friends in high places: Zeus has given him a Sword and Apollo has given him the Seven Tears of Icarus which can be used to mark chambers within the labyrinth.

Apart from the monsters, you've also got to cope with mum who is busy moving objects around. She'll also kill your sister Electra, given half a chance, which would be a blow as the Gods have revealed the solution of your quest to her.

All this plot detail gives the game plenty of flavour. It is complemented by the graphics of the catacombs, filled with pillars, columns, and animated monsters. The controls are easy to use using a combination of joystick movements and the fire button to move, fly, fight, pick up and drop objects. There is also a pause key which helps when making a map.

Your task is a long and difficult one. It's a large maze, and even when you find the objects, there are only six real ones among the 64 scattered around. Should Clytaemestra manage to kill Electra, your task will become immensely more difficult, so much of your time will be spent chasing Clytaemestra around so that she doesn't have a chance of getting to Electra.

The Greek legends of heroic quests make great themes for games and this is certainly a well executed example.
Lee Paddon

Star Strike

- *Spectrum 48k*
- *Real Time Software*
- *£5.95*
- *Arcade*

★ ★ ★

FOLLOWING UP their successful version of the arcade classic 3D Tank Duel, this is an excellent version of the current arcade hit. There are four screens to battle through: a space battle with the tie fighters, a low level run over the ground defences, the trench, and finally a shot at the reactor.

There are many difficulty levels running from the turkey shoot to the suicide run. All stages are in 3D with your cockpit controls in the foreground. The controls are nice and responsive with climb, dive, roll and fire; a variety of joysticks can be used.

Good meat-and-potatoes arcade action.
Lee Paddon

the only choice

Kuma AMSTRAD CPC464 software

Holdfast | Gems of Stradus | Star Avengers | Galaxia | Music Composer

Logo | Database | ZEN Assembler | EASIVAT | Home Budget

An outstanding selection from Kuma's rapidly expanding range of Entertainment and Application Software for the Amstrad CPC464 Micro-computer.

Book:

● **The Amstrad CPC 464 Explored**

This superb book is designed to let every CPC464 user, at whatever level, get the most from his computer. After an introductory section on the special Basic features, the book looks in depth at the excellent sound and graphic facilities including: *● Animation ● Windows ●Character sets ● Multitasking ● 3 Voice Times ● M/C routines for Basic ● Use of Zen ● Use of O/S ● Sample programs*

Available from your nearest Amstrad CPC464 Stockist.

Kuma Computers Ltd., 12 Horseshoe Park, Horseshoe Road, Pangbourne, Berks RG8 7JW.

Please send full catalogue on Amstrad CPC464 products.

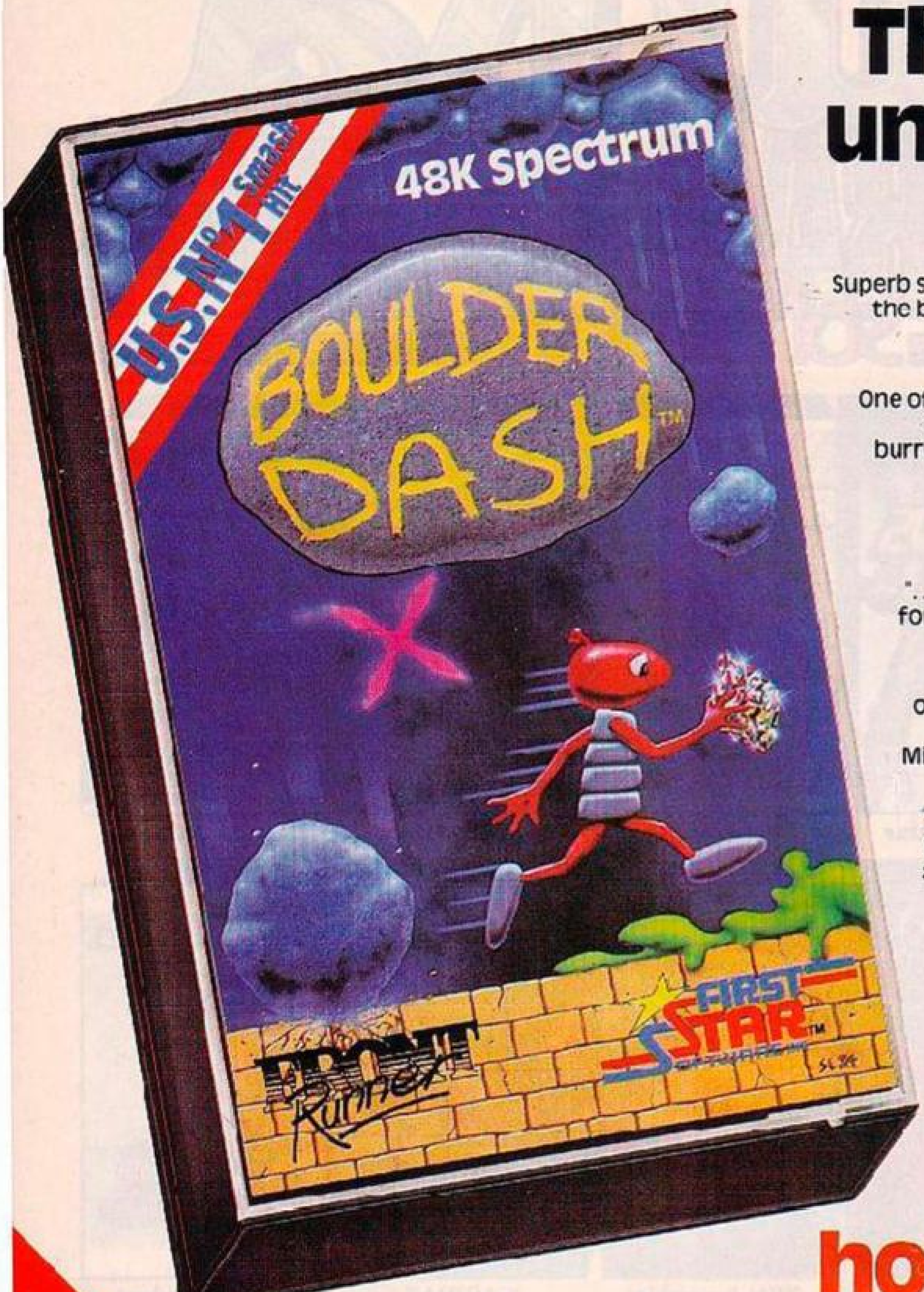
Name ....

Address ....

.... Phone..................

Trade Enquiries Phone 07357-4335

Now on 48K Spectrum



The ultimate underground adventure

Superb scroll routine, described by experts as one of the best pieces of Spectrum programming ever! Sixteen mystical caves, 5 levels of play, joystick or keyboard options.

One of the toughest tests of strategy and reflexes ever! Starring "Rockford" TM the incorrigible burrowing bug in his restless quest for gleaming jewels.

U.S. Reviews

"... Boulder Dash should be leading contender for anybody's action-game-of-the-year award."
Burt Hochberg **GAMES Magazine**

"... a magical mix of challenge, charm and originality ... easily one of the best computer games of the year."
Michael Blanchet **Chicago Tribune Syndicate**

"This game will be mentioned in my will ... what silicon is and integrated circuits were always meant to be ... subtle brilliance and unceasing magic ... in a class by itself ..."
Craig Holyoak **Deseret News**

"First Star has done a first-rate job on BOULDER DASH ... the graphics are dazzling ..."
The Video Game Update

"BOULDER DASH takes the cake ... the overall quality is excellent ..."
John Skoog **K-Power Magazine**

This one's hot for Xmas!

U.S. No 1 Smash Hit

FRONT Runner

FIRST STAR SOFTWARE INC

To: Front Runner, K-soft distribution, 620 Western Avenue, London W3 0TU

Tape £7.95 including VAT

Rush me ________ Tape(s)

Name ________

Address ________

________ Post code ________

Telephone ________ YC/2/BD

I enclose a cheque/PO made payable to

K soft distribution for £ ________ (post free)

or debit my Access/Visa* ________

Delete as applicable

I would like to hear news of more Front Runner releases ☐ Yes

Please allow 21 days for delivery.

QUEST Corner

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.

NEWS
oaeo
rssu
tttt
h h

The crystal ball

At the time of writing, Doomdark's Revenge, the follow up to Beyond's brilliant Lords of Midnight, has only been on the market a week but already I have heard of one player who has completed it. Astonishingly, David Harvey of Dereham in Norfolk managed to succeed in the new quest after playing it for just six days.

There's still the third part of the trilogy, The Eye of the Moon, to come. We lesser mortals are still gathering our armies in part 1.

If you've got any Christmas cash left, all three parts of The Ket Trilogy from Incentive Software are available in a handsome gift pack at the special price of £12.95, a saving of £3.55 on the set. A splendid bargain for adventurers.

A helping hand

Readers — can you assist with a plea for help form B. Kamphuis of The Netherlands concerning Quicksilva's Smugglers Cove?

He can't cope with the wide trench, oak door, trap door and collapsed tunnel. Can anyone help?

For Artic's Golden Apple players:

■ Shadow a hindrance?
ELOH OG NEHT FFO PMAL NRUT

■ Beggar and crocodile awkward?
CORC DEEF: ENO REHTONA HCTAC: RAGGEB OT NOMLAS EVIG

Dying of cold on the glacier in Acornsoft's Countdown to Doom?
REICALG FO DNE TA RESAHP ERIF

Sorcerer of Claymorgue Castle

Various
Adventure International
£7.95

THIS IS the best adventure out of my leather pouch this month. I must confess to liking all of Scott Adams adventures but this is definitely his finest yet.

You play the part of Beanwick, an inexperienced wizard, whose mission is to enter Claymorgue Castle and recover 13 lost stars. When you start, you already have a number of spells and will find more on your travels. Only trouble is, you don't know what these spells actually do.

If you want attractive graphics, you'll find them here.

Tower of Despair

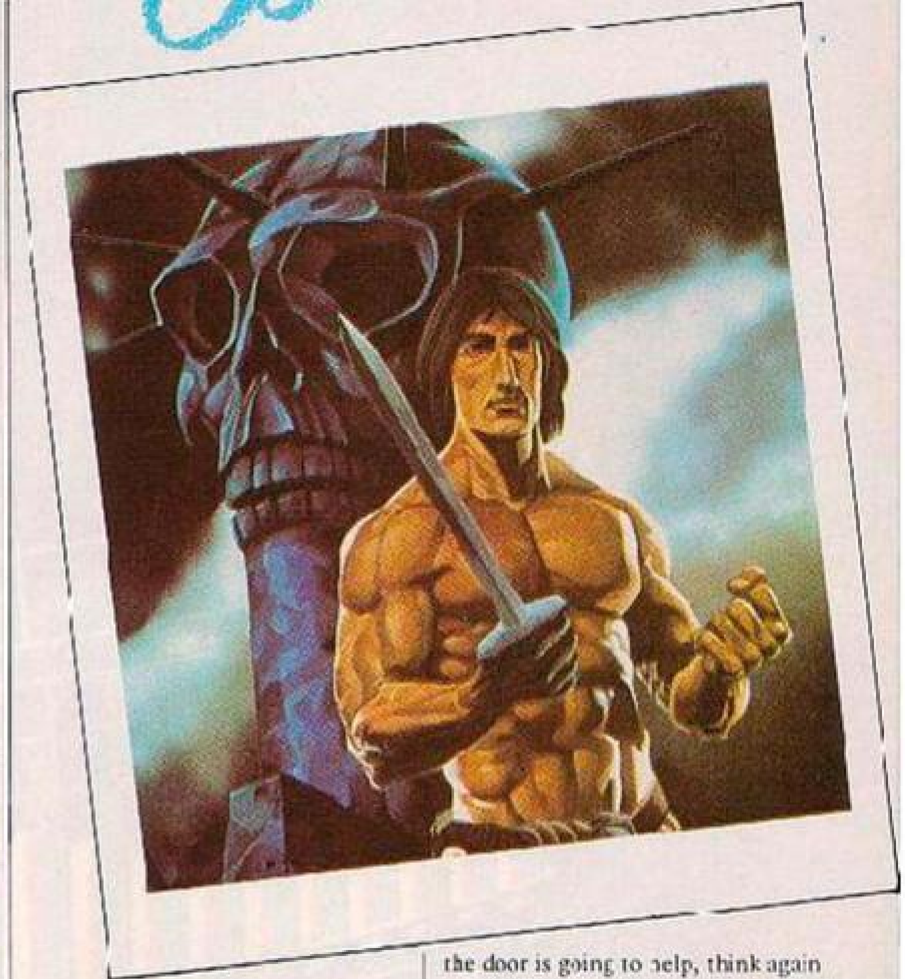
Spectrum
Games Workshop
£7.95

SPECTRUM OWNERS should keep a sharp eye out for this. It is a text-only adventure with a big difference. For instance, the character set has been immaculately redesigned and decorated so that the text appears like a monastic illuminated manuscript. Very attractive.

The adventure is an enthralling atmosphere and is imaginatively detailed. This is an adventure where examining objects will pay rich dividends. A glossy booklet sets the scene and includes a couple of maps and a number of pictures of the major locations.

You must first find the Gold Gauntlet before you journey to The Tower of Despair, there to overcome the owner of the King of Skulls, the evil Malnor, who once more threatened the land.

Tower of Despair is just the program for those who like thick and rich detail, oodles of atmosphere and plenty of challenge. Games Workshop are perhaps better known for their expertise in other areas of the fantasy game world.



Blade Warrior

Spectrum
Cable Software

THIS IS A TEXT adventure, written with the aid of Gilsoft's ubiquitous Quill. The game has a largish vocabulary — over 140 verbs, fast response and an interesting plot. Your job is to hunt down the Black Witch, following in the footsteps of Mazar the Wizard who went before but has not been heard of in many moons.

The game has one of the best openings I can remember seeing in an adventure. You have been chased by a large band of Orcs and in your anxiety to escape have lost all your possessions. You now stand at a dead end, a wall at your back. There is a solid door in the wall but the Orcs are closing in for the kill.

The wall is unclimbable and if you think that simply rushing through the door is going to help, think again — the Orcs charge through and tear you to pieces. As they say on TV, now get out of that!

Forest of Doom

CBM-64
Penguin Books
£4.78 + VAT

THIS IS A computerised version of the best selling Fighting Fantasy gamebook of the same name.

It is mainly a text game, the prose being presented teletype style on a manuscript — a scrolling scroll! You make decisions by selecting from a number of choices given at the appropriate point.

The game remains very faithful to the book but in order to cram the whole thing on to a micro, some of the game's data has to be loaded in at different stages. The program automatically tells you when to do this.

There are a number of options to make the playing enjoyable. You can control the speed at which the text is printed, even pause it, and can return to the start of a section, just like you would turn back a page in a book. You can even store and recall a scroll fo your own text — very handy for making notes as you play.

I liked it — a splendid fantasy yarn and a refreshing change from the usual style of adventures.

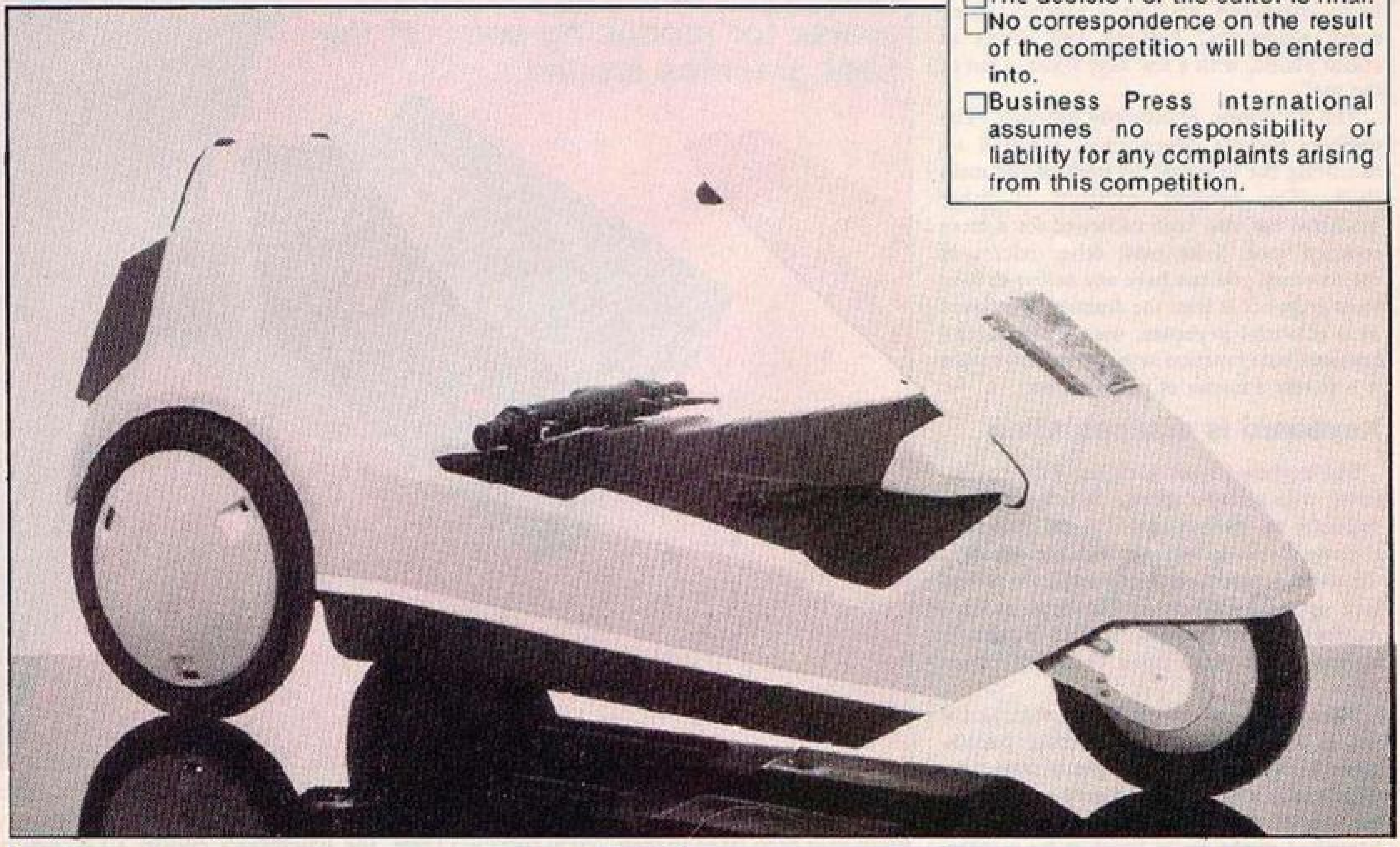
AVAILABLE FROM
High Street Computer Retailers
and branches of W. H. Smith, Boots,
John Lewis Partnership, Laskeys, Currys.
EVEN THE PRICE WILL KEEP YOU IN THE BLACK
This sleek, black Microvitec CUB medium resolution colour monitor has been designed to be totally compatible with the Sinclair Q.L. An ability to display 85 column text is combined with outstanding graphic capabilities – at a price that won't break the bank.
£275
(inc. VAT)
Specification
Model:
CUB 1451/DQ3
14" Q.L. Monitor
RGB TTL input
Tube Resolution (pixels)
653(H) x 585(V)
Dot Pitch 0.43mm
Bandwidth 18 MHz
Also available in Standard Resolution version for only £225 inc. VAT.
MICROVITEC 653
cub
COLOUR DISPLAYS
Microvitec PLC, Futures Way, Bolling Road, Bradford BD4 7TU, West Yorkshire. Tel: (0274) 390011. Telex: 517717

SINCLAIR C5 CLIVEMOBILE *competition*

Our Uncle Clivemobile may look like a latterday Mod scooter but it doesn't necessarily mean that Sinclair's gone off his rocker. Win one of these C5 electric super trikes in our fabulous February competition and be the first silent rider on your block.

RULES

- ☐ The winner of the competition will be the person who numbers the features of the C5 correctly and enters the most original idea for a computer gadget to go in a car in the view of the editor.
- ☐ The name of the winner will be printed in the April issue of *Your Computer*.
- ☐ All entries must arrive at the *Your Computer* offices by the last working day in February 1985.
- ☐ Each person may enter the competition only once.
- ☐ Entries to the competition cannot be acknowledged.
- ☐ No employees of Business Press International or their relatives may enter the competition.
- ☐ The decision of the editor is final.
- ☐ No correspondence on the result of the competition will be entered into.
- ☐ Business Press International assumes no responsibility or liability for any complaints arising from this competition.



SINCLAIR C5 *competition*

Put yourself in Sir Clive's place. You have just launched your C-5 supertrike and before going on to produce electric four-wheel cars, buses, trucks and juggernauts, all guided by artificial intelligence and travelling at 200mph, bumper to bumper, you want to ease yourself in by inventing a computerised gadget which will make driving easier or more fun. Invent a gadget then give it a name, fill in the coupon — remembering to put the features of the C-5 in order — a 1 in the box next to your favourite feature, a 2 beside your next preference and so on. Then send it to *Your Computer*, L-22', Quadrant House, The Quadrant, Sutton Surrey SM2 5AS.

- ☐ Low running costs
- ☐ Low purchase price
- ☐ Lightweight
- ☐ Easy to park
- ☐ Can be driven by 14-year-olds

Idea for gadget__________

____

____

Name of gadget__________

Name__________

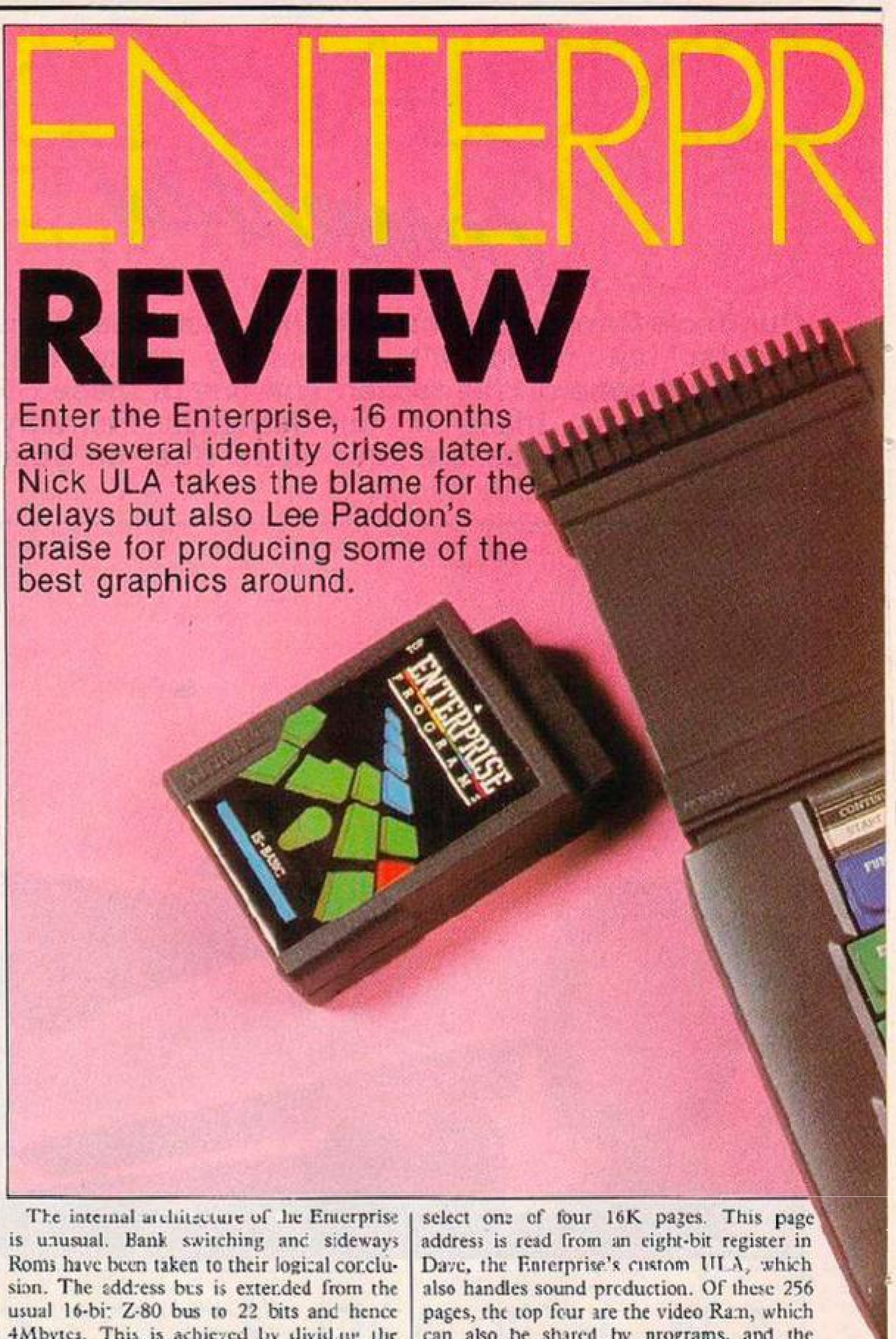
Address__________

____

ENTERPR

REVIEW

Enter the Enterprise, 16 months and several identity crises later. Nick ULA takes the blame for the delays but also Lee Paddon's praise for producing some of the best graphics around.



IN AN INDUSTRY notorious for broken delivery promises, the Enterprise stands head and shoulders above the competition. First seen in public in September 1983, the machine is only now going into mass production.

When first announced, it seemed to offer a level of performance most micro owners only dreamed about. However, a lot of bytes have flowed under the bridge since then. Several innovative new arrivals have beaten it to the high street, and the industry stalwarts are even more entrenched with huge user bases and software support.

A year or so ago, a machine had to be good to succeed, now it has to be very good to even survive. So how does the new machine measure up to the competition? Geoff Hollington, the designer of the Enterprise's casing, had some hard words to say about the looks of other machines when *Your Computer* interviewed him in January 1984: "Most home computers are just a printed circuit board sandwiched between two sheets of cream plastic, with a few keys sticking out of the top".

The Enterprise is certainly different. The machine is only 33mm high, achieved by mounting the keyboard in front of the main PCB. The box-like contours of other machines has also been eschewed for a more rounded look. Like most other micros of recent years, you can have any colour as long as its grey, but at least the drabness is relieved by a colourful keyboard, with green control keys and blue function keys. Whether you like it is purely a matter of personal taste.

Keyboard is disappointing

The keyboard itself is rather a disappointment, with a rather spongy feel that will not endear it to touch-typists. On the plus side, the keys are nicely laid out, with everything in the usual positions, and any odd keys tucked well out of harm's way. The most striking feature of the keyboard is the built-in joystick, instead of the more usual cluster of cursor keys.

This looks a bit on the flimsy side, and it will be interesting to see how much punishment it can take from the games fraternity. That aside, it is certainly a very easy way to edit text and programs, although the hamfisted might easily knock it by mistake. There are eight function keys, which can be used with the shift and Alt keys to produce 32 combinations.

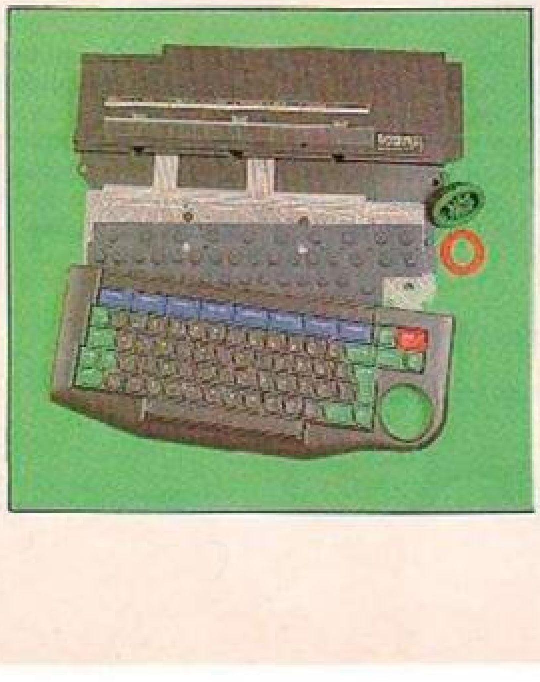
Around the back of the case are a series of ports. Enterprise seems to have cut costs here and we are left with the old edge connectors, instead of a few proper sockets which cost that little bit extra. There are ports for two joysticks, an RGB monitor, a printer and a serial/network port.

There are also the necessary sockets for a television, a power supply but no on-off switch, and a cassette port. The reset button is usefully positioned at the extreme left of the rear panel. One press for warm reset, two for cold.

The Rom bay on the left of the machine can accommodate Roms up to 64K and on the right is the expansion socket which gives access to not just the main address and data buses, but the audio and video circuitry as well.

The internal architecture of the Enterprise is unusual. Bank switching and sideways Roms have been taken to their logical conclusion. The address bus is extended from the usual 16-bit Z-80 bus to 22 bits and hence 4Mbytes. This is achieved by dividing the address bus into two.

The two most significant bits are used to



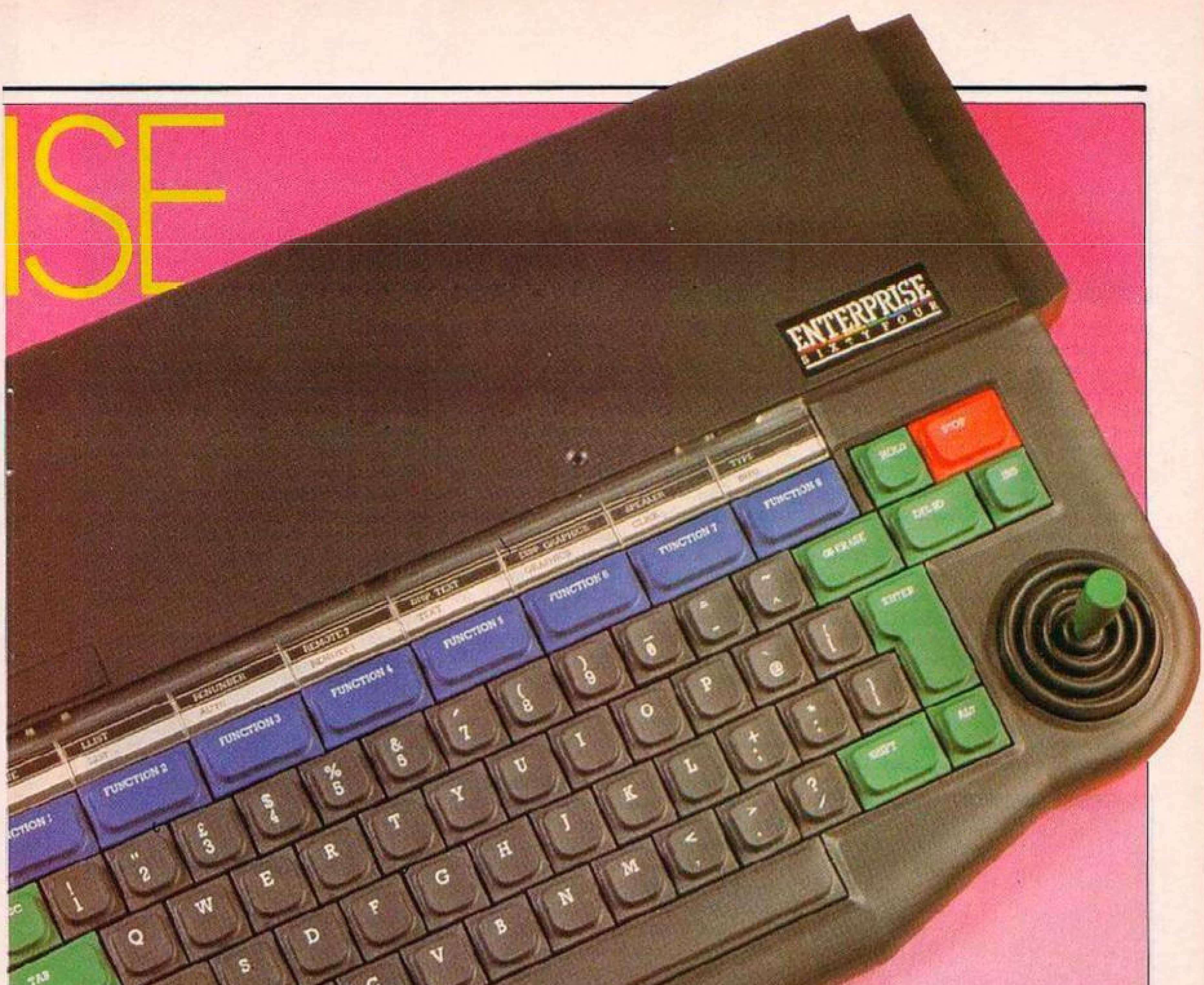
select one of four 16K pages. This page address is read from an eight-bit register in Dave, the Enterprise's custom ULA, which also handles sound production. Of these 256 pages, the top four are the video Ram, which can also be shared by programs, and the operating system's scratchpad.

The system Rom sits in the bottom two pages, and the cartridge turns up in pages four to seven. While this is all very clever, it does rather tie up the processor, which has to mess about with page address. Still, when you've got a Z-80A processor cracking along at 4MHz, you've got a little time to spare.

The operating system EXOS has been designed for flexibility. All devices are accessed using channels. This will of course allow simple expansion.

Apart from Dave, the other custom chip in the Enterprise is Nick, apparently the cause of all the delays. Nick handles the screen, and it hardly seems surprising some trouble was encountered with this revolutionary design. Most computers have a certain amount of memory assigned to the display. This might

ISE



vary with the video mode in use, but you are always sure where it is.

Nick changes all that. Any part of the 64K of Ram can be assigned to Nick. The user simply defines parameters of mode, width and height, and the operating system assigns the required amount of Ram to it.

It is a similar concept to graphic windows, but these windows can be slid around the screen at will. There are five modes, lo-res graphics, hardware text, hi-res graphics and software — 80 column — text, and attribute mode which mixes the two. On top of that you also have to specify the number of colours you want. This can be 2, 4, 16 or 256 colours. The more colour, the less horizontal resolution.

Maximum resolution is 672 wide by 512 deep, although this can be doubled using "interlace". The text is on an 8 by 9 matrix, with 25 lines. The versatility of the video display will enable complex graphics to be built up easily, and with a modest memory overhead.

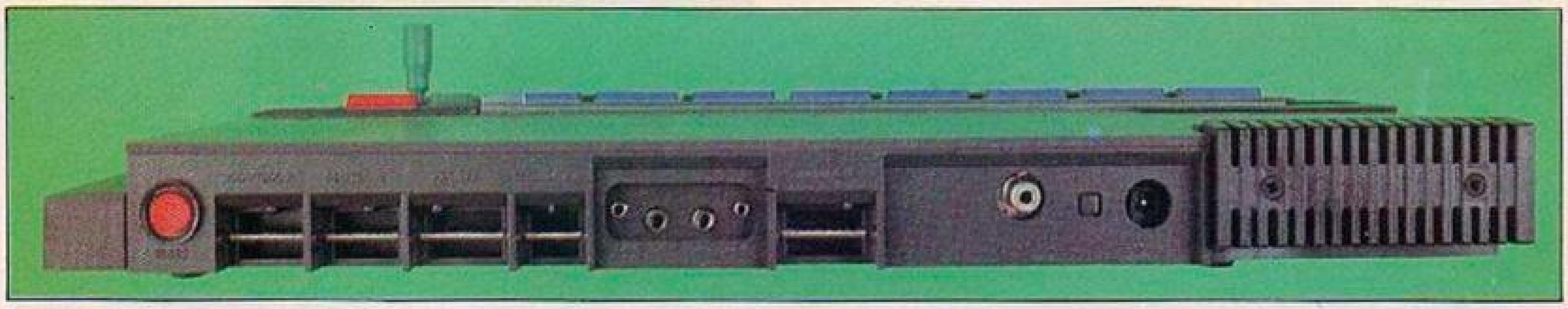
When Dave isn't busy with memory maps, he's producing some very pleasant sounds. There are three sound and one noise channels. The sound is in stereo over eight octaves, and rather wasted on the internal speaker, using external speakers or headphones is a must if you want to appreciate Dave's finer points.

Each sound command can state volume and pitch as a function of time, in stereo. Various special effects can also be produced using distortion, filtering, using another sound channel to determine the cut-off frequency, and ring modulation.

The Basic comes on a cartridge and is another one of the machine's strong points. Whilst retaining all the usual features of standard Microsoft basic, IS-Basic has features which normally only come as Basic extensions.

The central philosophy is obviously to encourage the programmer to think structure, and borrows many features from Pascal. If this sort of language had been the standard when Basic got going, it might not have got

(continued on next page)



(continued from previous page)
such a bad name for itself.

Apart from the usual If . . . Then . . . Else structures, which can be carried over several lines, it supports Do loops using While or Until conditions at the beginning or end of the loop. There is also an Exit command for further flexibility in structures. The Case statement is rather like setting up a "flag" which is tested to determine if certain statements are executed.

IS-Basic supports the use of "global" and "local" variables. This means that a subroutine can use the same variable as the main program without being affected, merely passing parameters to the main program as needed. This means that subroutines can be transportable from program to program, without having to be rewritten.

An extension of this idea is that several programs can be resident in Ram at the same time, with the same line numbers. Control

and variables can be passed between them when editing programs.

The principal graphics command is Plot, which moves the graphics cursor. If the co-ordinates are followed by semicolon, a line is drawn between the new and old position in the current ink colour. There is also a set of Logo type graphics commands as well as Elipse and Fill commands. Ink, Pen and Border colours are selected from a palette of 256 colours. These can be selected by number, or name, or you can specify the amount of red, blue and green you want. Possibly more use to commercial artists and printers than programmers.

Sound commands are simple. The Basic sound command can be followed by a number of parameters stating pitch and volume over time and any special effects. A series of sound commands can be issued to the four channels, and these sit in a queue waiting to be executed. In case you lose all track of the duration of sounds on the various channels, a Sync command will set you straight, or just Clear the queue and start again.

The Basic is generally very comprehensive, and really lets the user get at the guts of the machine without having to resort to machine code all the time. If anything it might be accused of being rather longwinded and unwieldy, but then you don't have to use all of it.

The very wide format of Basic commands means that very little error checking is done when the program is entered. There are also a number of words which can only be entered in immediate mode, although this is really only a minor criticism of a fascinating dialect of the Basic language.

The only reason I can imagine for a programmer wishing to leave Basic is speed. I'm afraid IS-Basic isn't going to keep Beeb owners awake at night. Even the humble Spectrum shows the machine a clean pair of heels on most benchtests.

Included with the machine is the power supply, UHF lead, two cassette leads, the Basic cartridge, the inevitable demonstration cassette and several booklets. These are the setting-up guide, the demonstration manual and the programming guide. The setting-up guide explains very simply what's what on the machine, so that the terms used in the other books won't mystify even the complete novice.

It also explains how to load taped software. This is certainly a simple process on the Enterprise, you just hit the button marked start. To make sure you get the playback volume right, there is a blob on the display during loading, and if this flashes green to red, the volume is correct.

As far as the demonstration tape goes, the programs are hardly dramatic. But at least they are short Basic programs which will actually teach you how to write your own rather than the designer's *pièce-de-résistance* in 30K of machine code which teaches you very little.

Finally we come to the programming guide,

which at nearly 230 pages looks fairly daunting for even the seasoned veteran. It is divided up into three sections: getting acquainted, the tutorial and the reference section. Getting acquainted is the standard beginner's introduction, but worth a glance through by experienced programmers. It steers the path between mystification and condescension very well.

The next section introduces the core of IS-Basic. It spends a large amount of time on the structure commands, with plenty of examples, but towards the end rather glosses over several of the more interesting subjects, for instance it barely mentions attribute graphics.

So while the beginner will have something to keep him busy, anyone interested in graphics will be forced to pick up the clues from the demo tape, or wait for the inevitable flood of "Get the most from your Enterprise" type books. The reference section gives a comprehensive list of IS-Basic commands, a glossary of computer jargon and a few more hints on using sound and vision. Not a bad effort all in all.

The Enterprise has a built-in word processor, which although rather crude could save on TippEx if your typing is a bit rough. It lacks features such as "search and replace", block move or block delete. It is, however, easy to use, with helpful on-screen prompts. Another handy idea is that a listed Basic program becomes a word processing file, so you can scroll up and down the whole listing. How many times have you let the line you wanted to edit scroll off the top of the screen and cursed this end-of-the-world effect? ■

CONCLUSIONS

- For £250, or £350 for the 128K version due out later this year, there is no doubt that the Enterprise offers the best value for money in hardware terms. The Basic is easy to use and will appeal to the beginner. To the more experienced programmer, the completeness of the Basic will be a revelation — no more Peeks and Pokes.
- They will also be able to delve quite easily into the depths of the operating system due to the open nature of the system and its channel based architecture. The hardware buff has also been catered for with the inclusion of the sound and video lines on the expansion bus.
- Perhaps the only cloud on the horizon is the reaction of commercial software houses. Because of the revolutionary concept the machine embodies, it will take them time — and hence money — to come to grips with the machine, especially if they want to get the most out of Nick and Dave.
- Thus Enterprise may find itself caught in a Catch-22 position where commercial software will not be developed until there is a big user base, and people won't buy the machine until they see that software is available.

The remarkable new Ferguson MCO1 TV is built on the famous TX chassis, so naturally it offers the best in picture quality.

But it also features DIN sockets for direct RGB and Composite Video input. Which means every signal, from whatever source, is transmitted directly to the screen without being demodulated.

The result is clear to see – and hear. No more fuzzy images. No more dull colours. Sharper wording and no hiss or hum on the sound.

Unique automatic source switching allows you to plug in your video recorder and any home computer with RGB output and leave them set up.

There's no need to unplug anything unless you want to carry the highly portable Ferguson MCO1 around with you.

A computer monitor that's also a colour television is the ideal second set for the modern family.

RENT OR BUY

And now you can rent or buy the Ferguson MCO1 from DER.

Rental costs just £8.95 a month. For that you get a lead compatible with your computer and full DER service. Or you can buy the package for only £225.

Simply fill in the coupon now and we'll arrange a free home demonstration soon.

The Ferguson MCO1 from DER will help you to understand all your programs more clearly. No fuzz, no bother.

We supply leads for the following computers BBC A and B, Acorn Electron RGB, Oric RGB, Lynx RGB, Sharp MX-711RGB, Dragon C/Video, Vic20 C/Video, Vic 64, Colour Genie, Sord-M5, Newbrain, Atari 300, Canon MSX.

I would like a free home demonstration of the Ferguson MCO1 Colour TV/Computer Monitor.

Name________

Address________

Telephone No.________

I prefer to rent ☐ buy ☐ YC

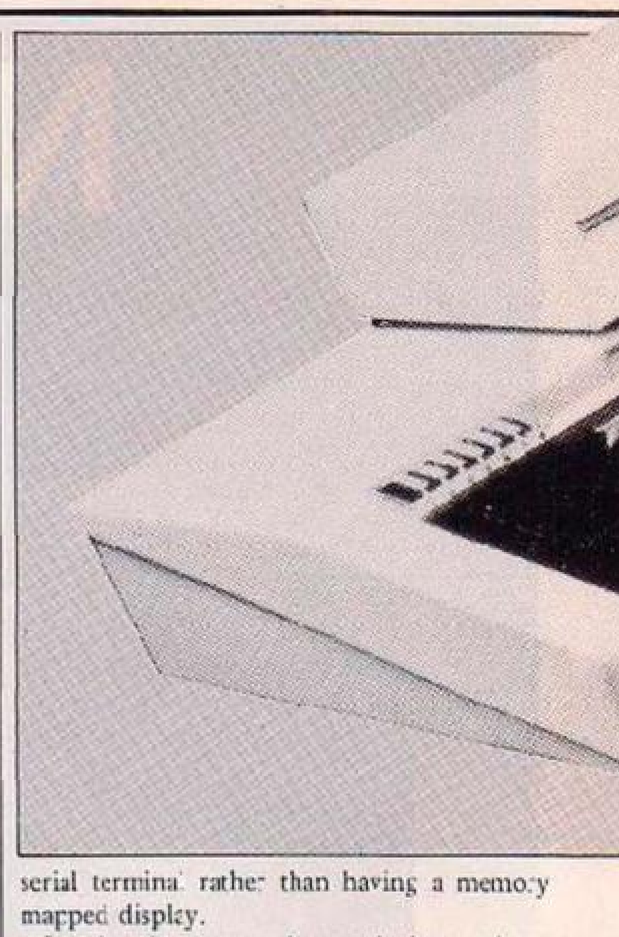
My home computer is:________

Send to DER, Home Computer Dept., Apex House, Twickenham Road, Feltham, Middx. You will be contacted within 14 days of receipt.

THAT'S DER
DOES YOURS DO THAT

Only 1 month advance rental required. Min. rental period 1 year. Rental customers must be 18 or over. Prices may vary at DER's discretion. Available in Gt Britain (mainland only). DER Apex House, Twickenham Road, Feltham, Middx.

VIEW AND SCRIBE



TEXT IS IDEALLY suited for manipulation by a microprocessor. The alphanumeric symbols involved can all be described by the permutations of eight bits — one byte — and many documents are shorter than the 16 bit addressing capability of the 6502 and Z80 CPUs.

VIEW and SCRIBE are word processor programs for the BBC microcomputer. VIEW is the official Acornsoft product and SCRIBE is distributed by Eucon Ltd. in Swansea — Merlin Computer Products, Eucon Limited, 35/36 Singleton Street, Swansea, SA1 3QN — Telephone 0792 467980.

A "word processer" program is comparatively easy to write in Basic provided that you limit yourself to a short text and only a few facilities. These programs are often published in computer magazines but really ought to be put into a different category as they bear little resemblance to a professional piece of word processing software. A good wordprocessor is like a sharp woodworking plane — unobtrusive, effective, versatile, ready to hand and conducive of good results.

There is, however, no single best wordprocessor because different people use "text" in entirely different ways for different purposes. A journalist will rarely want to handle a document longer than three or four thousand words. Conversely, the ease of operation and the speed at which text can be entered may be terribly important.

The layout of the printed text is likely to follow a simple pattern. On the other hand, a technical author, a mechanical engineer or a biochemist may require more than 80 columns for the production of tables and complex format controls to permit the insertion of diagrams, the representation of mathematical symbols and references to footnotes at the bottom of the page.

A person running a small business may wish to incorporate individual names and addresses into letters, and may want to alter the contents of the letter according to whether or not the recipient has paid a bill recently, enquired after a product or made one of a number of different mistakes in filling out an insurance proposal.

You could write one program that would deal with all these tasks and some people have tried to do this. "Integrated" software packages such as "1-2-3", "Symphony", and "Jazz" aim to offer both word processing and data handling in one package so that text can be mixed with the results from a spreadsheet analysis, or merged with data from the built-in database program.

But it is still very difficult to make the package comprehensive and simultaneously easy to use.

A menu, for example, is a screen display which allows you to choose which operation the program should carry out next. Menu-driven programs are easy to use but tend to become irritating after some time as the user becomes familiar with the range of options available. This problem becomes particularly important when the computer is used with a serial terminal rather than having a memory mapped display.

It takes longer to clear and then write a screenful of information on a serial terminal. Wordstar solves the menu difficulty by allowing the user to choose any one of four levels of help. At one extreme half the screen is taken up with helpful messages; at the other, you are assumed to know what you are doing and no messages are displayed.

VIEW can be used with either a cassette recorder, or one or two disc drives. It has many attractive features and some important drawbacks. If you use VIEW with the BBC micro set to Mode 3, you will be able to type and display text as it will look on an A4 sized piece of paper. You will be able to hold about 1,500 words of text in memory at any one time. Using a 40 column display VIEW will hold approximately 25,000 characters in memory, about 4,000 words. Secretaries and other professional word processor users will find it very difficult to work with a 40 column display.

The top line of the VIEW screen is reserved for the "ruler" which shows where the left and right margins are set, the position of any tab stops, an optional bell signal, and whether the text will be justified or not. Further information is given about Insert/Overwrite mode and Format mode which is another name for wordwrap. The starting options for VIEW are all fixed as the program is contained entirely in ROM firmware. Figure 1 shows two typical ruler lines.

SCRIBE uses a similar ruler line and is a very friendly progam which uses menus and messages to show the choices that are open to you at any stage of processing a document. SCRIBE is supplied as an 8K Eprom and a 40 or 80 track disc holding a number of procedures and utilities. To make sensible use of SCRIBE you will need two disc drives. The first, drive 0, holds the SCRIBE disc while the second is used for the disc holding the text. You could manage with a single disc drive but SCRIBE does use the program disc quite often to call up editing utilities such as "Reformat" so you must keep your documents on the same disc as some of the SCRIBE procedures.

Figure 1. VIEW Format rulers.

F I>............•......................•...b..................<

Produces text that lies between the triangular arrow margins. The computer beeps when the cursor passes the "b".

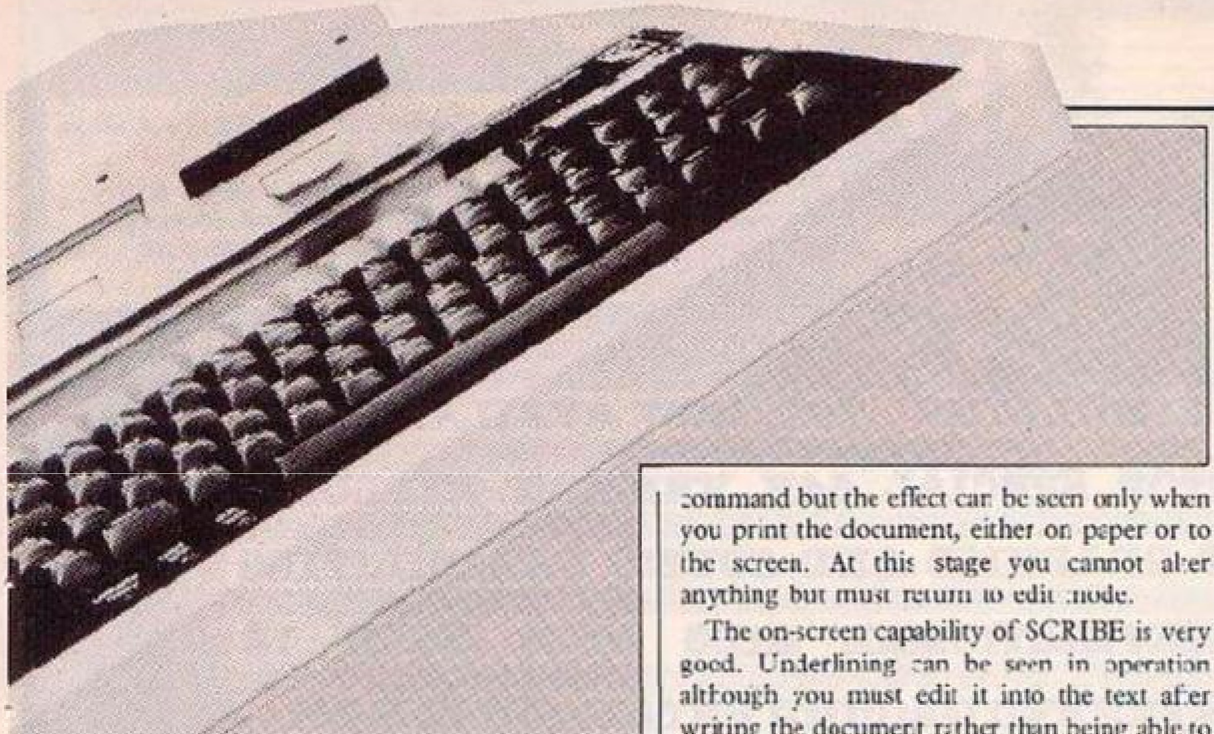
F I......................>......................•......................•...<

This ruler line shows a wider left margin and two tab stops. Up to 128 ruler lines can be set in a document; more than enough for almost any purpose.

Figure 2. Onscreen capabilities.

	VIEW	SCRIBE
Enter text 40/80 cols	Yes	Yes
Enter text > 80 cols	Yes (max 132)	No
Centre text	No	Yes
Fill & Justify	Yes	Yes
Right Justify	No	No
Underline	No	Yes
Page breaks	No	Yes
Set page breaks	No	Yes

	VIEW	SCRIBE
Wordwrap ON/OFF	Yes	No (always On)
Tab stops	Yes	Yes
Decimal tab stops	No	Yes
Left and Right margins	Yes	Yes
Reformat paragraph	Yes	Yes
Global Format	Yes	No (automatic)



John Dawson reviews View and Scribe — word processing programs for the BBC.

Unlike VIEW A 2.1 and many other microcomputer based word processors, SCRIBE establishes a number of fixed format "pages" when you create a document. The pages are laid out on the disc and you fill the pages as you type. An 80 track single density disc will hold between 55 and 60 A4 sized SCRIBE pages. The enormous advantage of this approach comes when you wish to move backwards through a document.

The Edit command in VIEW is fine provided that you only want to work your way through the text from the start to the finish. But if you forget to carry out some editing or decide that a couple of paragraphs will read better earlier on, you must save the block of text on to the disc, finish editing the text and start all over again from the beginning. When you come full circle you can set a marker, exit to the command level and read in the block of text from the disc. If the block is longer than the spare capacity in VIEW — about 1,200 bytes in Mode 3 — you will have to change into Mode 7 because VIEW stops reading from the disc when the free space is full.

Using SCRIBE you can move to any page in your text just as you wish. Press function key f7 and the prompt line asks "Page number?". The up and down cursor keys will select the previous page or the next page respectively after saving the current page to the disc.

For longer reports, book chapters, articles, essays and epic poems, this facility cannot be overrated.

If you want to move beyond the adjacent pages you simply enter the absolute page number and the program will move to the page you want. The number of the current page is displayed constantly at the top of the screen. There are two other important commands that will repaginate the document, moving excess material into or out of consecutive pages until all is arranged correctly.

The on-screen editing and display capabilities of the two programs are shown in figure 2. Note that this figure refers to what the program can do to display text on the screen while you are editing it. VIEW A 2.1 can right justify text, for example, by using an edit command but the effect can be seen only when you print the document, either on paper or to the screen. At this stage you cannot alter anything but must return to edit mode.

The on-screen capability of SCRIBE is very good. Underlining can be seen in operation although you must edit it into the text after writing the document rather than being able to turn it on and off as you go along.

Using SCRIBE I miss the Shift cursor keys in VIEW which allow you to move along a line one word at a time. However VIEW will not move the cursor to the right hand end of the previous line when the cursor reaches the left hard margin and this and other drawbacks create a niggling handicap. Neither program is perfect in terms of the cursor commands. The edit facilities are shown in figure 3.

SCRIBE permits far better control of the printed document than VIEW. The Printer driver generator program that is available for VIEW does make use of the features in a range of printers but the codes for obtaining the commands, although superficially easy to use, are clumsy for out of the ordinary functions such as one and a half line spacing. SCRIBE presents you with 18 global options to change the format of the text or to switch between a serial and a parallel printer.

Once you have established the conditions that are to apply to a particular document you can save them with the text so that they will come into operation when you access the document again. You can alter the master disc to make the program boot up with a different set of default values — a clever combination of firmware in the Eprom and software on disc.

Figure 3. Edit commands.

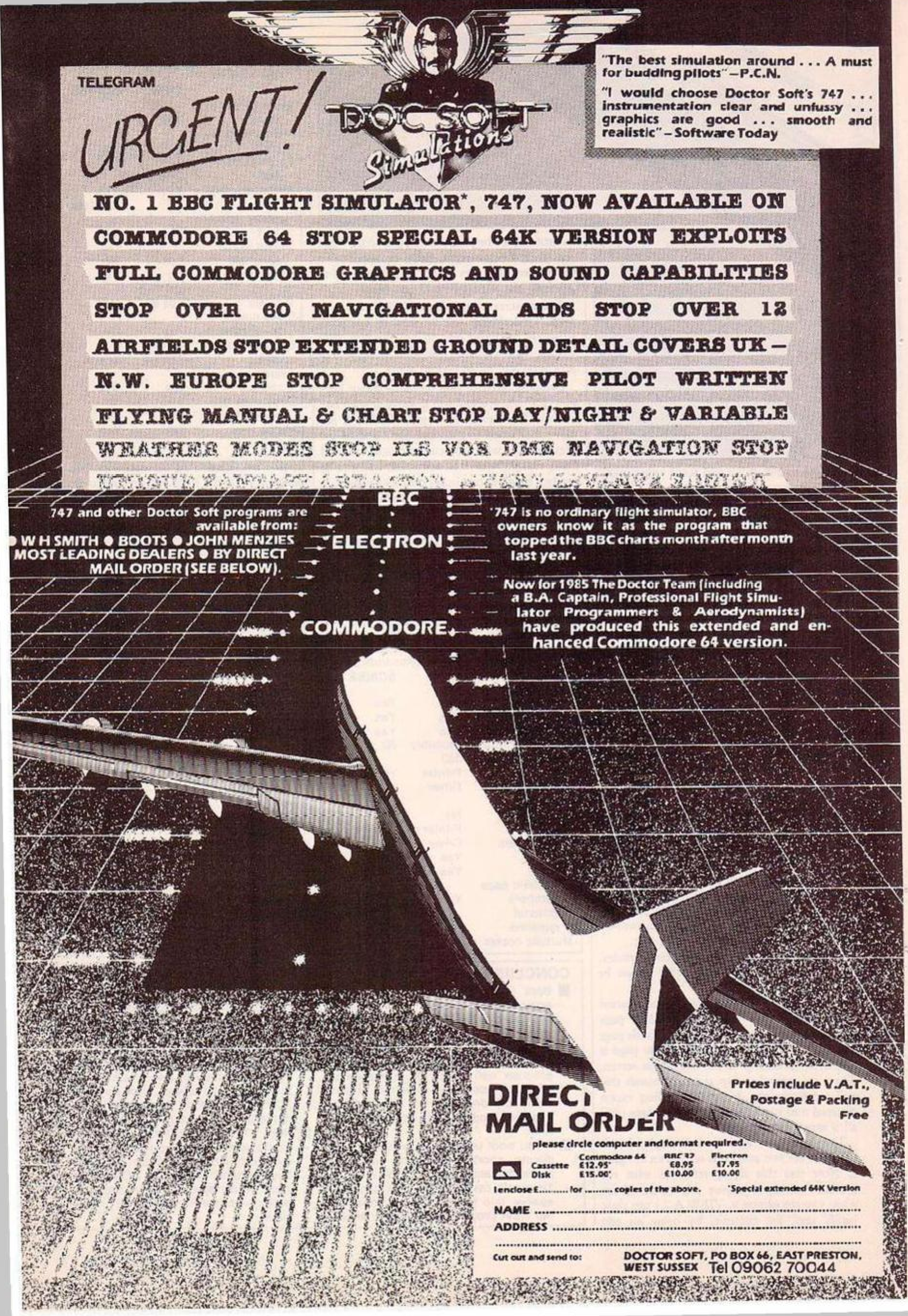
	VIEW	SCRIBE
Move cursor by word	Yes	No
Move cursor by page	Yes	Yes
Top/bottom of text	Yes (short text)	No
Move/copy/delete block	Yes	Yes (limited)
Recover deleted text	No	No
Delete word/sentence	Yes	No
Underline	No (printer)	Yes
Markers	Yes (6)	No
Swap upper/lower case	Yes	No
Search whole/part	Yes	Yes
Search and replace	Yes	Yes
Copy case of search text	Yes	No
Merge files	Yes	Yes
Edit Basic programs	Yes	Yes

Figure 4. Printer format commands.

	VIEW	SCRIBE
Left margin offset	Yes	Yes
Top margin	Yes	Yes
Bottom margin	Yes	Yes
Maximum print width	probably 132	80
Printer initialisation	Printer Driver	Yes
Control characters	No	Yes
Redefine characters	Printer Driver	Yes
Headers	Yes	Yes
Footers	Yes	Yes
Automatic page numbers	Yes	Yes
Additional registers	Yes	No
Multiple copies	No	Yes
Two sided headers (books)	Yes	No
Set page end	Yes	No (on-screen)
Line spacing	Yes	Yes
One and a half spacing	No	No
Single/continuous sheets	Yes	Yes
Print part of text	Yes	Yes
Use form feeds	Printer Driver	Yes
Change pound character	Printer Driver	Yes
Mail merge	Yes (limited)	No (database *)

CONCLUSIONS

- Both VIEW and SCRIBE are more powerful and easier to use than Wordwise. SCRIBE works in much the same way as a commercial word-processor such as the Wordplex series. It is a deliberate, careful program well suited to professional computer users, that is people whose livelihood depends on not making mistakes and getting work done on time.
- If you work under great pressure producing short documents such as press releases then VIEW will be marginally faster to use. You must set against this the continuing errors in the VIEW program such as the failure to recognise a full file specification.
- The documentation for VIEW is quite long but curiously incomplete.
- VIEWINDEX and the VIEW Printer Driver Generator program add to the facilities in VIEW but the combination of an Eprom and disc in the SCRIBE package is flexible and powerful. An integrated database package for SCRIBE will be on the market when this article is in print.
- Both VIEW and SCRIBE are good wordprocessors and you should try to test both before deciding which to buy. Probably I shall use SCRIBE for most of my writing — articles and books — but VIEW is no bad choice either.



"The best simulation around . . . A must for budding pilots" – P.C.N.
"I would choose Doctor Soft's 747 . . . instrumentation clear and unfussy . . . graphics are good . . . smooth and realistic" – Software Today
TELEGRAM
URGENT!
DOC SOFT Simulations
NO. 1 BBC FLIGHT SIMULATOR*, 747, NOW AVAILABLE ON COMMODORE 64 STOP SPECIAL 64K VERSION EXPLOITS FULL COMMODORE GRAPHICS AND SOUND CAPABILITIES STOP OVER 60 NAVIGATIONAL AIDS STOP OVER 12 AIRFIELDS STOP EXTENDED GROUND DETAIL COVERS UK – N.W. EUROPE STOP COMPREHENSIVE PILOT WRITTEN FLYING MANUAL & CHART STOP DAY/NIGHT & VARIABLE WEATHER MODES STOP ILS VOR DME NAVIGATION STOP
BBC
ELECTRON
COMMODORE
747 and other Doctor Soft programs are available from:
● W H SMITH ● BOOTS ● JOHN MENZIES MOST LEADING DEALERS ● BY DIRECT MAIL ORDER (SEE BELOW).
*747 is no ordinary flight simulator, BBC owners know it as the program that topped the BBC charts month after month last year.
Now for 1985 The Doctor Team (including a B.A. Captain, Professional Flight Simulator Programmers & Aerodynamists) have produced this extended and enhanced Commodore 64 version.
747
DIRECT MAIL ORDER
Prices include V.A.T., Postage & Packing Free
please circle computer and format required.
Commodore 64 / BBC 32 / Electron
Cassette £12.95* £8.95 £7.95
Disk £15.00* £10.00 £10.00
I enclose £.......... for .... copies of the above.
*Special extended 64K Version
NAME ....
ADDRESS ....
Cut out and send to:
DOCTOR SOFT, PO BOX 66, EAST PRESTON, WEST SUSSEX Tel 09062 70044

COMPETITION *of the year*

When we set the Competition of the Year we thought you would find it a doddle. Most of the quotations contained a clue to the personalities who said them. The others could be found by a process of elimination. Who else but Acorn supremo, Herman Hauser, could have talked about leapfrogging Clive Sinclair? And surely Douglas Adams is the only one who makes jokes about computers.

But only a third of the entries matched up the quotations correctly, with more people stumbling at the second quote than any other. This was said about the Spectrum in 1982 by an unusually flippant Clive Sinclair. The correct order of personalities was as follows: 6, 7, 5, 8, 2, 4, 1, 10, 3, 9.

Clive Sinclair's quip was perhaps a little too close to the bone. A large number of the quotations submitted as tie-breakers were about Sinclair's delays and the claimed unreliability of his computers. Paul Mummery, 48 Woodland Gardens, N. Wooton, King's Lynn, Norfolk had the Queen waiting to knight Clive Sinclair: "What do you mean, Clive Sinclair might be a little bit late?". This wins him a VTX-500 modem for his Spectrum.

The best quote along these lines came from K. Joughin, 32 Woodlea Road, London N16, who wins the Yamaha CX-5M for "Never deliver today what you can deliver in six months' time". Tactfully attributed to A Computer Manufacturer, we felt this struck a suitably sonorous and pithy note. A. Goodsell had the same idea expressed slightly differently and wins a copy of Melbourne House's adventure program, Sherlock Holmes.

D. Walker, 16 Manor Gardens, Hunmanby, Filey, N. Yorks, almost got it right with: "So, Merion, we are agreed, Mr Walker of Hunmanby will take the first prize", attributed to the Editor. What the Editor actually said was: "Mr Walker shall have a modem".

The other modem goes to BBC owner J. Watmough, A16 Hepburn Hall, St Andrews, Kingdom of Fife, Scotland who had Herman Hauser saying, "Well, has anyone run a power station with a ZX-81?".

We awarded a day at the controls of a Rediffusion flight simulator to M. Burton, 15 Boswall Quadrant, Edinburgh. His inspiration was: "O Romeo, Romeo, wherefore art thou Romeo — Silence, fair maid, I hath nearly scored a million at Pac-Man". P. Aylin's quote was "I never win anything in these bloody competitions". Not in itself original but we were touched by his rather earnest "N.B. this can only be funny if I actually win something" — for which he wins a copy of Sherlock Holmes.

For the rest, copies of Sherlock Holmes to A. Karhumaki, D. Tordoff, B. Allan; and copies of Elite to N. Olner, S. Cunningham, T. Hunt, C. Fraser, F. Hatten, A. Furness, J. Hammond, M. Simper, and I. Davidson win themselves a binder each.

INTO THE A

It seems that what happens in the arcades is a good guide to what will happen on home micros. Meirion Jones investigates.

WHEN CHARACTERS like Pac Man sprang from the screens of the expensive purpose-built consoles lurking in pub corners on to home computers everyone was amazed.

Back in 1977 if you wanted to play Space Invaders at home you had to buy a £1,500 monochrome arcade monster. If you were lucky you could even have colour — although the conversion looked as if it had been done by an over-enthusiastic Blue Peter presenter.

"Well all you need for this toy is a black and white video game and three strips, red green and blue, of see-through sticky backed plastic, just stick the plastic on the screen and there you have it. Super. Next week Eugene will be showing you how to build your own software house, and Clive will tell you how to deliver a micro within 28 days. Great."

And when you finally tired of zapping invaders it would cost you another £1,000 to change to a different game. Within two years most arcade games make the transition to the home micro often losing little but price on the way. Machines like Atari's £130 800XL makes a surprisingly good alternative to pumping cash into a coin slot if you want to play Pole Position or Pac Man, and you can have a whole library of different games for a few tens of pounds.

So if we want to look at the action games of the future for our home computers the first place to look is today's arcades. Obviously adventure games which may take hours or days to play are developing faster for the home than they are for the coin machines. There the operators are looking to make a fast buck.

Even so, the graphics are increasingly emulating those of their arcade cousins, despite the advantages that custom video circuitry gives the slot machines. Often they use the same processors — Atari's latest System 1 machine for instance which is introducing Marble Madness to windswept seaside piers and unswept motorway service areas around the country is based around Motorola's 68010 — a chip off the same silicon block as the 68008 in Sinclair's QL.

Even the technological edge which laser-based games such as Firefox and Mach 3 have given the arcades is about to be nibbled away by the likes of Pioneer with its MSX micro plus laser disc home system — *Your Computer* December 1984. The Pioneer will come with the relatively crude Sega Astron Belt which launched the first wave of laser slot machines in 1982.

Astron Belt used a deliberately degraded Star Wars style background film on video in the hope that the relatively crude computer-generated profile of a spaceship which you guide to the death star would not appear too artificial. Its successors had different strengths, Atari's Firefox put more effort into the computer animation while Mach 3's appeal stemmed from its power to convince you that you really were manoeuvring an F-15 hurtling over the tree tops. Even if you occasionally wondered how the enemy attack helicopter managed to fly backwards at 500 miles an hour just so you could get a clean shot at them.

But the latest generation of laser generated cartoon games — like Super Don Quixote — would make Hanna Barbera drool. You can sit and watch the entertainment rather than play yourself as a would-be windmill tilter guides the Don past hazards new fencing off giants or skipping from rock to rock to avoid being swept off in a flood.

Unfortunately the graphics have sometimes outstripped the abilities of the writers to make the games challenging. It is easy to see why Minoru Arakaura — the American President of Nintendo, one of the Japanese companies which has been at the forefront of arcade entertainment — says "there are no real games on laser yet; it is just a matter of reflexes and timing. No skill or strategy on the part of the player is involved."

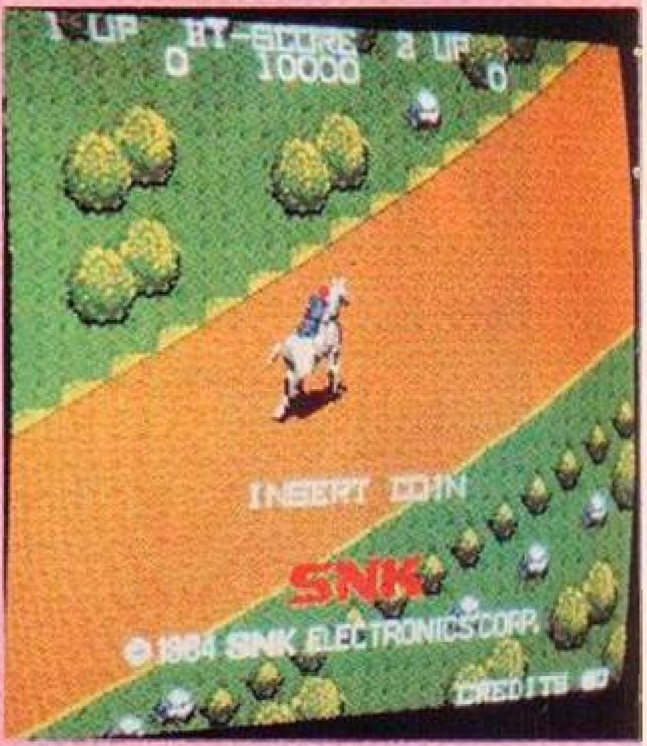
But then again Nintendo has no laser games of its own so perhaps its just sour rice on his part.

It will be a long time if ever before home systems can hope to compete with rides like Doron's "swear-you-are-there" SR-2 which looks like a squashed minibus on hydraulic rams but is actually a sophisticated simulator designed for amusement parks and big arcades.

It was demonstrated for the first time in this country at the January 1985 Amusement Trades Exhibition International at Olympia. Up to a dozen people can take their seats in the SR-2 and when the doors close and the front screen lights up you soon lose any feeling that you are watching a film as the module you are in starts to tip and sway to complete the illusion of motion.

At the show a bunch of sober suited, cynical sales executives joined me for what was billed as a roller-coaster ride on the SR-2. Everyone was suitably impressed but unenthusiastic when the simulator tipped 45° backwards as the front view showed the first slope when the roller coaster was cranked up.

Then after reaching the top and starting the long descent the speed with which the



RCADES

hydraulic rams were able to tip us backwards and forwards and side to side as we went through the dips and bends shook everyone out of their complacency. When we hurtled into a shadow and out the other side to find ourselves flying free over a river there were 11 gasps and a cry of "Holy smoke" from an alarmed but polite middle-aged American.

Even more startling was the run down a bobsleigh track which followed it — now we could understand why they asked us to wear seatbelts as the cabin snaked from side to side through the icy bends, before emerging on a race track in severe danger of crashing into a Porsche.

This first SR-2 in this country will go to Bicton Park in Devon — there are already a few of an earlier model in places like Blackpool — but if you want one of your own I am afraid it will cost you £80,000 plus £1,200 for every new film and software module you order.

Money is the name of the game for arcade operators and Paul Moriarty of Taitel, one of the biggest distributors of machines in Britain, which originally brought Space Invaders to these shores has to decide which of the many games he is offered will be the winners. In a typical week he might get three different new arcade games, often from Japan, which come on interchangeable circuit boards or discs if they are for the lasers.

The boards are getting smaller all the time — the latest batch is notebook sized. All you have to do is slot one in and change the labels to turn your Pacman machine into Pac Land. The TV screen is often on a turntable so you can convert the console to an upright game like Crown Golf in seconds.

He tries them out at a number of test sites — the list is secret and the places are rotated as a precaution against piracy. If the take is good, an exceptional new game can take as much as £80 a day on one machine. Then Taitel will buy up to 500 boards in one go, and at £500 to £700 a board that can be a lot of money.

Piracy poses the same sort of problems as elsewhere in the computer industry. In the early days the producers were naive about copying but now every board comes with a security chip — although it is only a matter of time before that is broken and then copies are produced by the thousand — often made in Taiwan. When the locations of test sites have leaked out, says Paul "it has been known for an employee of another firm to go in and rob the board."

At least laser-disc based games are much more difficult to copy by like many others in the business Paul still has his reservations about them. "They have to be made cheaper" he says and with price tags of £2,000 to £5,000 for a complete laser system compared with about £1,300 for its conventional equivalent you can see what he means.

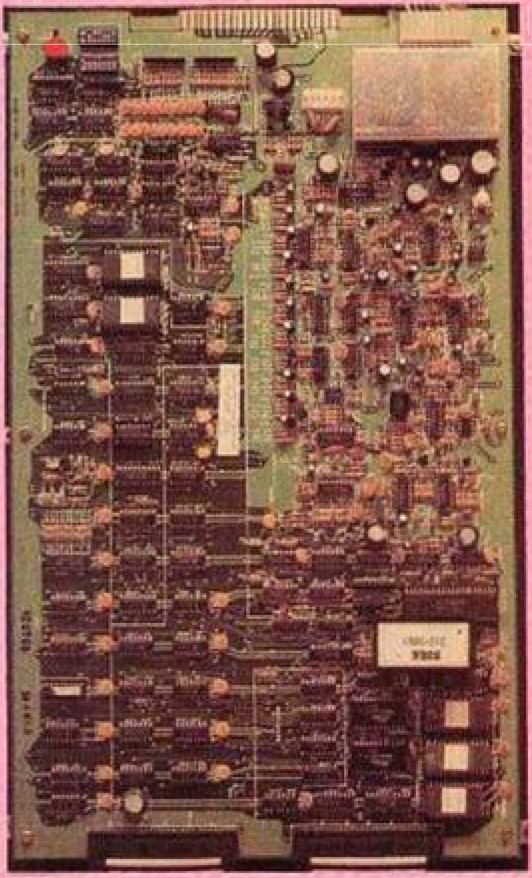
Machines are getting bigger — Sega's GP World has two TV screens, Atari's TX-1 three — but not necessarily better. Paul's own favourite game is still Qix which he thinks was ahead of its time "they should re-release it now" but he thinks that the newer "conventional games are getting as good as laser".

He can point to games like those shown on this spread — Pac Land with its cartoon quality graphics and Future Spy which takes the Zaxxon idea a whole step further. Gladiator, also shown, he is less enthusiastic about because despite some very good graphics in chariot racing sequences it is too much like the racing games which dominated 1984's Olympic

summer

Games like Track and Field and Hyper Sports were astonishingly successful but they caused their own problems as consoles took a hammering from would be sprinters and long jumpers. Those companies that opted for the joystick rather than buttons to control what was happening on screen soon realised their mistake as the sticks took a year's wear in a couple of weeks. Sometimes the strain can be too much — in the case of Buck Rogers Taitel eventually had to fit £100 cast iron joysticks to take the punishment.

Many of the latest Japanese games stress individual combat — like Punch Out and Karate Champ II, while tie-ins with films such as Indiana Jones and the Temple of Doom and television series are still popular sources for inspiration. ■



PINBAT

WE HAVE TRIED to make a game that is different to traditional Pinball but which retains the feeling that skill and judgment, as well as a certain amount of luck, are all involved. Machine code is used for animation effects, score display and the bats, leaving all control of the "marble" in Basic, but using an array system to speed things up.

As with our other ZX-81 programs nearly everything is done by direct Poking and Peeking, to and from the ZX-81's character-mapped screen memory so everything in the game 'actually exists' on screen, not just as co-ordinates. Note that the Demo mode runs at about half speed.

It is possible for the marble to collide with any of 24 different types of object — left wall characters, right wall, gates, bats, etc. — and in most cases a different routine is needed to provide a suitable reaction, such as a bounce, a bonus, a special effect, etc. The most obvious approach is to use a series of If . . . Then checks to sort out which object the marble has hit and so which routine to call, but even in a fast Basic this would give an uneven response and a noticeably 'sticky' bounce of the marble.

Pinbat uses a more structured system, where the codes of the characters that the marble hits are read directly from off the screen and used to slice out individual elements from an array which in turn contains *pre-arranged* line numbers to Goto.

An example will make this clearer; Look at line 40; X is the marble's position onscreen, so X + DI — direction — is the marble's next intended position, and the Peek of this gives you the character that the marble is about to "hit".

Now assume that the marble has just hit a 'minus' character. The Sinclair Code for this character is 22, so the 22nd element of the array H gets selected and this contains the line number of the required routine to Goto in this case the "lost marble" routine at line 470. In this way the single line 40 can branch directly to all the necessary routines, most of which will then go back into the main loop.

Line 4280 specifies the line numbers associated with each of the characters that the marble could hit, and is a handy reference. In practice, all the array subscripts are shifted up by one — by line 4300 — because Sinclair arrays do not have a zero element.

A little extra planning-ahead is needed to initially fill up the Goto array with the correct line numbers, but the advantages are more than worth the trouble. The method is practically independent of the number of choices to be made, and so could be expanded even further without loss of speed, but at present only Sinclair Basic allows this particular type of computed Goto. In some ways it is more powerful than an On Goto command.

Note that the first element of the Goto array contains 10, so that when the marble is hitting Chr$ zeros — i.e. travelling through empty spaces — line 40 will Goto line 10 to continue the main loop. Also, as a safety precaution in case of typing errors, *all* those elements of the Goto array that correspond to unused characters have been given a default value of 460, so that if the marble hits something it shouldn't, say a score-digit character, then line 40 branches to line 460 which prints "error" and stops the program before the marble can plough on through addresses that

Disassembly.

```
4082 3A2140   LD   A,(4021)
4085 3D       DEC  A
4086 2035     JR   NZ,40BD
4088 3A2540   LD   A,(4025)
408B 3C       INC  A
408C 200A     JR   Z,4098
408E 217D40   LD   HL,407D
4091 223240   LD   (4032),HL
4094 010000   LD   BC,0000
4097 C9       RET
4098 3E34     LD   A,34
409A CDA940   CALL 40A9
409D 50       LD   D,B
409E 3E01     LD   A,01
40A0 CDA940   CALL 40A9
40A3 78       LD   A,B
40A4 BA       CP   D
40A5 3825     JR   C,40CC
40A7 1837     JR   40E0
40A9 2A0C40   LD   HL,(400C)
40AC 01A000   LD   BC,00A0
40AF 09       ADD  HL,BC
40B0 0E12     LD   C,12
40B2 0621     LD   B,21
40B4 BE       CP   (HL)
40B5 C8       RET  Z
40B6 23       INC  HL

40B7 10FB     DJNZ 40B4
40B9 0D       DEC  C
40BA 20F8     JR   NZ,40B2
40BC C9       RET
40BD 3A2540   LD   A,(4025)
40C0 FEFE     CP   FE
40C2 2808     JR   Z,40CC
40C4 FE7F     CP   7F
40C6 2818     JR   Z,40E0
40C8 010000   LD   BC,0000
40CB C9       RET
40CC 2A0C40   LD   HL,(400C)
40CF 11D802   LD   DE,02D8
40D2 19       ADD  HL,DE
40D3 0618     LD   B,18
40D5 56       LD   D,(HL)
40D6 23       INC  HL
40D7 5E       LD   E,(HL)
40D8 72       LD   (HL),D
40D9 2B       DEC  HL
40DA 73       LD   (HL),E
40DB 23       INC  HL
40DC 10F7     DJNZ 40D5
40DE 48       LD   C,B
40DF C9       RET
40E0 2A0C40   LD   HL,(400C)
40E3 11F302   LD   DE,02F3
40E6 19       ADD  HL,DE
40E7 0618     LD   B,18

40E9 56       LD   D,(HL)
40EA 2B       DEC  HL
40EB 5E       LD   E,(HL)
40EC 72       LD   (HL),D
40ED 23       INC  HL
40EE 73       LD   (HL),E
40EF 2B       DEC  HL
40F0 10F7     DJNZ 40E9
40F2 48       LD   C,B
40F3 C9       RET
40FE 216441   LD   HL,4164
4101 3E25     LD   A,25
4103 BE       CP   (HL)
4104 2005     JR   NZ,410B
4106 361C     LD   (HL),1C
4108 2B       DEC  HL
4109 18F8     JR   4103
410B 34       INC  (HL)
410C 2A0C40   LD   HL,(400C)
410F 115D02   LD   DE,025D
4112 19       ADD  HL,DE
4113 112000   LD   DE,0020
4116 010041   LD   BC,4100
4119 FD367885 LD   (IY+78),85
411D 7E       LD   A,(HL)
411E FE76     CP   76
4120 2803     JR   Z,4125
4122 0A       LD   A,(BC)
4123 03       INC  BC

4124 77       LD   (HL),A
4125 19       ADD  HL,DE
4126 FD3578   DEC  (IY+78)
4129 20F2     JR   NZ,411D
412B 010000   LD   BC,0000
412E C38240   JP   4082
4131 119CD4   LD   DE,D49C
4134 1808     JR   413E
4136 111718   LD   DE,1817
4139 1803     JR   413E
413B 111110   LD   DE,1011
413E 2A0C40   LD   HL,(400C)
4141 010600   LD   BC,0006
4144 09       ADD  HL,BC
4145 010001   LD   BC,0100
4148 7E       LD   A,(HL)
4149 B8       CP   B
414A 2001     JR   NZ,414D
414C 73       LD   (HL),E
414D B9       CP   C
414E 2001     JR   NZ,4151
4150 72       LD   (HL),D
4151 23       INC  HL
4152 0B       DEC  BC
4153 AF       XOR  A
4154 B0       OR   B
4155 B1       OR   C
4156 20F0     JR   NZ,4148
4158 C38240   JP   4082
```

```
   3 REM FIRST REM LINE CONTAINS
ANY 200 CHARACTERS (SEE TEXT)
   4 REM PINBAT/J.DAVE.ROGERS+
COLIN HOGG/WALTON,LIVERPOOL/1984
   5 RUN 4000
   6 REM -----CHANNELERS------)
   7 LET DI=33*SGN DI+USR 16639
   8 IF PEEK (X+DI) THEN LET DI=
-DI
   9 REM ------MAIN-LOOP------)
  10 POKE X+DI,52
  20 POKE X,0
  30 LET X=X+DI+USR 16514
  40 GOTO H(1+PEEK (X-DI))
  45 REM ----LINE 40 BRANCHES TO
ROUTINES FROM 5 TO 470 ACCORDING
TO CHR$ HIT(REFER TO LINES 4200-
ETC). ALL USR CALLS HAVE VALUE 0

  49 REM -----TRIBOOSTERS-----)
  50 LET DI=32
  55 POKE X-DI,136
  60 GOTO 100
  70 LET DI=34
  75 POKE X-DI,136
  80 GOTO 100
  90 LET DI=33
 100 PRINT AT 1,2;T$(.7+RND*2.7)
 110 GOTO 10+USR 16514
 129 REM ------DROPGATES------)
 130 POKE X+DI,137+(PEEK (X+DI)=
137)+USR 16514
 140 LET DI=32+INT (RND*3)
 150 GOTO 40+USR 16514
 159 REM ------SIDEWALLS------)
 160 LET DI=DI+2-(33 AND DI=-1)
 170 GOTO 10
 180 LET DI=DI-2
 190 GOTO 10
 199 REM ------FLINGSTARS-----)
 200 POKE X,0
 210 LET X=X+DI
 220 POKE X,CODE "O"
 222 POKE X,CODE "O"
 224 POKE X,CODE "O"+USR 16594
 230 LET DI=CODE "▀▀▀"(CODE VAL
LEN "(.5+RND*9))-164
 240 POKE X,CODE "*"+USR 16514
 250 LET X=X+DI+USR 16638
 260 IF NOT PEEK X THEN GOTO 10
 270 LET X=X-(DI AND PEEK X>155)
 280 GOTO 220
 289 REM ------ROLLOVERS------)
 290 POKE X,USR 16603
 300 LET X=X-DI
 310 POKE X,(PEEK X)+1-(10 AND P
EEK X=165)
 320 POKE X+DI,52
 330 GOTO 30
 339 REM ----BATS---(▟ ▀ ▙)---
 340 LET DI=-34
 350 GOTO 10
 360 LET DI=-33
 370 GOTO 10
 380 LET DI=-32
 390 GOTO 10
 399 REM ---------BONUS--------)
 400 PRINT AT 7,5;"WELL DONE.BON
US=";B;AT 7,5;
 402 FOR B=B TO B+5-1
 404 LET MC=USR 16638
 406 NEXT B
 408 PRINT "
 410 FOR N=X-133 TO X+34 STEP 33
 412 POKE N,137+RND
 414 POKE N+2,PEEK N
 416 NEXT N
 418 GOTO 10
 419 REM ------MISC-HITS------)
 420 LET DI=34*SGN DI
 430 GOTO 10
 440 PRINT AT 13,29;"▀▀"
 450 GOTO 30
 460 PRINT AT 7,0;"UNSPECIFIED C
HARACTER HIT,CHECK PROGRAM",,STOP
 470 REM -----MARBLE-LOST-----)
 480 POKE X,0
 490 FOR N=1 TO 16
 491 POKE X+DI,CODE "X++-++X----
+X++-"(N)
 492 NEXT N
 500 REM -----BATS-SELECT-----)
 510 LET B$=("▛▀▜" AND SN=2)+("
▟▙▟▙" AND SN=5)+("▙▛----▜▟"
AND SN=6)
 520 IF B$="" THEN LET B$=("▟▙"
```

Dave Rogers and Colin Hogg challenge you to become a pinball wizard on the ZX-81.

shouldn't be Poked!

This includes the ZX-81's dreaded Newline characters, lurking unseen down the side of the screen, the Poking of which invariably results in irretrievable crashes.

Something else that can't be seen onscreen is a "character 90" just above the launch channel. It is Poked there by line 670 — it can't be printed — and it is not seen because there is no bit-pattern for it in the ZX-81 Rom so it just looks like a space character, but it is used here as an invisible trigger. When the marble hits it then line 40 branches to line 440, printing a 'lid' over the launch channel to seal it off.

Line 230 looks odd, but it is the shortest way of selecting one of nine different directions at random, by using the Codes of various Chr$ sliced out of a string to yield values rather than doing calculations.

Note that when any of the machine-code sub-routines return to Basic their value is 0, so wherever you see "+USR" in the listing this is just a short way of calling a machine-code subroutine, it does not affect the numerical value of whatever calculation it was included in.

Usr 16514 Scrolls screen line 22 — columns 1 to 28 — sideways by one space, with wrap-around — this moves the various bats — *either* under Inkeys control when in play mode, or in response to an automatic routine when in Demo mode. All the other m-code subroutines return to Basic *via* this bat-move routine, thereby giving more continuous bat control.

Usr 16588/Usr 16608 (Separate entry points into the above routine). Scrolls line 22 left/right respectively. This is done simply by swapping adjacent *pairs* of display file bytes and then moving in sideways increments of one, repeating 28 times in all. Wraparound is achieved automatically when using this method since after a complete line of swaps the line itself will have moved one way but the end character will have been 'bucket-brigaded' across to the opposite end — work it out!

The "autobat" routine starts at 16536. It scans the screen to find the bat and the marble, works out their relative column positions and then calls whichever of the above scroll routines is needed to move the bat to catch the marble.

Usr 16694 Scans the screen (lines 4 to 16) for "asterisk" and "plus" characters, and wherever one is found swaps it for the other giving an animation effect. The next time it is called it will swap the characters back to their originals.

Usr 16689 As above, but scans for left and right brackets characters.

Usr 16699 Same again, but for characters whose Codes are held in addresses 16690 and 16691 i.e., redefinable by Poking those addresses.

Usr 16638 Adds one to the score (which is held in a permanent store area, see below) then copies this into the screen.

Usr 16652 Copies the score onto the screen but without adding anything to it.

Poke 16660 Spacing between digits when score is copied onto the screen.

16734 to 16740 Score store area. Before each game, lines 860-880 in the Basic reset these bytes to "zero" characters.

First enter 'Fast' mode then type in, as line one, Rem plus exactly 230 of any characters. Now type in the whole listing and, *resisting* the temptation to Run it straight away, Save and label two backup copies!!

When first Run, the machine code gets Poked into the Rem and is sum-checked as it goes in. Having corrected any errors, as indicated, and checked that the program works, you can then erase all lines from 7000 onwards and Save a few working copies using the Autosave (goto 3000). Always Clear before Saving otherwise you will Save the array on tape, making loading unnecessarily long — the array — is 1k in actual size, since each number = 5 bytes — also select "slow" mode.

Please check carefully the following lines — "gs" indicates characters obtains using graphic mode and Shift: All greys are gsH.

230	gsW, gsR, gs6 inverse 7, 8, 9, keywords Code, Val, Len. *No* extra spaces.
960	inverse right bracket, 30 spaces, inverse left bracket.
970	inverse left bracket (gsl). 980 gs2, gsR, gsH, gsW, gs4.
2460	(all inverse) Q. –, Q. Second string, Y.
4260	(This line is so important it is checksummed). gsQ, gs7, gsW, gs2, gsR, inverse Y, inverse Q, inverse space, gsN, gsJ, gsM, gsF, gsG, gsH, gs0, gsl (rest are normal characters).
1010	gsF, gsJ and inverse zeros are used.
2040	one space between the brackets.
4090-4100	gsN and gsM are used.
4410-4430	gsD and gs6 are used. Type exactly as shown, some words 'contain' marbles for use on their screen.
5110	2 inverse spaces, inverse 0, 2 inverse spaces, inverse 0, Inverse space, 7* gsF, inverse space, inverse 'hogrog', 7* inverse spaces, gsJ's and gs B's.
440	inverse left bracket, 2 inverse spaces.

When playing, use two fingers of one hand

(continued on next page)

```
AND NOT DEM)+("▙" AND DEM)
 530 PRINT                  AT 21,0;"
█                              █ █
▒-------------------------------▒ ▒
▒";TAB 31;"▒";AT 22,14;B$
 600 REM -----NEW-MARBLE------)
 610 LET D"=-33
 620 LET X=VAL "790+PEEK 16396+2
56+PEEK 16397+USR 16652"
 630 LET M=M-1
 640 PRINT AT 23,1;M$(M-29 TO M)
 650 IF M$(M)="." THEN GOTO 700
 660 IF M$(M)<>"O" THEN GOTO 630
 670 POKE X-363,90
 680 POKE X,CODE "DCC0"(4-RND*3)
 690 IF INKEY$="" AND NOT DEM TH
EN GOTO 680
 692 FOR N=1 TO 15 STEP 3
 694 PRINT AT 13,29;"█U █U █U █
U  U"(N TO )( TO 3)
 696 NEXT N
 698 GOTO 100
 700 REM -------NOW-WHAT?------)
NEW-SCREEN/GAMEOVER/RESTART/DEMO
 710 IF SN<6 THEN GOTO 900
 720 IF DEM THEN GOTO 800
 730 PRINT AT 13,2;"P TO PLAY AG
AIN/D FOR DEMO";AT 22,13;"GAME
OVER"
 740 POKE 16691,USR 16588+USR
     16689+USR 16699+USR 16694
 750 POKE 16690,(8 AND RND>RND)
```

```
 760 LET D$=INKEY$
 770 IF D$<>"D" AND D$<>"P" THEN
GOTO 740
 800 LET DEM=(D$="D")
 810 POKE 16417,DEM
 820 IF DEM THEN PRINT AT 22,1;
" DEMO MODE ANY KEY TO ESCAPE "
 830 LET SN=0
 840 LET M=LEN M$+1
 850 LET B=40
 860 FOR Z=16734 TO 16740
 870 POKE Z,CODE "0"
 880 NEXT Z
 900 REM ---DRAW-EMPTY-TABLE---)
 910 LET SN=SN+1
 920 PRINT                 AT 0,0;"
█████████████████████████SCORE██
█"+T$(1+RND+RND)+"▒▒▒▒▒▒▒▒▒▒█"
 930 LET ANG=VAL "1+(33 AND (SN=
1 OR SN=3 OR SN=4))"
 940 POKE 16660,ANG
 950 FOR N=2 TO 20
 960 LET P$="█
           █"
 970 IF N>13 THEN LET P$(30)="█"
 980 IF N<9 THEN IF ANG=34 THEN
LET P$(23+N TO 31)="▀▙▄ "
 990 PRINT P$
 991 NEXT N
 992 IF ANG=1 THEN PRINT AT 2,25
;"▒//////";TAB 25;"▒▒▒▒▒▒▒";TAB 30
;"█"
```

```
1000 REM ----SCREENS-DATA-----)
1010 LET P$=("▘ ▝" AND (SN=1 OR
 SN=4))+("(  00  )  (  00  )" AND SN
=2)+("+█-++█-" AND SN=5)+("0000
" AND SN=6)
1020 LET S$="C1008.C1018.T1110.T
1310.T1120.T1320.T1115.T1315.F05
03.F1203.P0509.P0514.P0811.P0820
.P0925"
1030 IF SN=2 THEN LET S$="P0504+
P0512+F0903+F1008+F0325+P1404+P1
412"
1040 IF SN=3 THEN GOTO 2400
1050 IF SN=4 THEN LET S$="F0404/
P1105/F0414/P0509/F1324/C0913/C0
610/C1116/C0903/T0813/T1106/T151
0/T1115/T1518/T0721"
1060 IF SN=5 THEN LET S$="R0504:
00516:G0905:E0917:R1306:S1318"
1070 IF SN=6 THEN LET S$="P0703,
P0721,P0725,F1304,F1316,C0503,C0
515,C1009,C1021"
1100 REM -----DRAW-SYSTEM-----)
1110 FOR N=1 TO LEN S$ STEP 6
1120 LET X$=S$(N TO )
1130 LET D=VAL X$(2 TO 3)
1140 LET F=VAL X$(4 TO 5)
1150 GOSUB 2000+(30 AND X$(1)="C
")+(70 AND X$(1)="F")+(90 AND X$
```

(continued on next page)

(continued from previous page)

```
(1)+"T")
2150 NEXT N
2170 IF BALL THEN PRINT AT 12,26
;"*";TAB 26;"*"
2180 GOTO 500
2000 REM --DRAW-SUBROUTINES---)
2010 PRINT AT D,A;P$
2020 RETURN
2030 FOR D=D TO D+5
2040 PRINT AT D,A;"[illegible]"
2050 NEXT D
2060 RETURN
2070 PRINT AT D,A;" *";TAB A;"**
*";TAB A;" *"
2080 RETURN
2092 PRINT AT D,A;CHR$ (157+RND*
3)
2100 RETURN
2400 PRINT AT 5,5;"[illegible]"
2410 FOR A=4 TO 22 STEP 6
2420 LET D=VAL "10+12 AND (A=10
OR A=22)"
2430 FOR N=D TO D+5
2440 PRINT AT N,A;"[illegible]"
2450 NEXT N
2460 PRINT AT D-1,A;"[illegible]";TAB A;
"[illegible]";AT D+5,A-1;"[illegible]";TAB A;"[illegible]"
2470 NEXT A
2480 GOTO 500
3000 REM -------AUTOSAVE--------
3010 CLEAR
3020 SAVE "[illegible]" BY J.DAVE.ROGERS
AND COLIN HOGG
3030 PRINT AT 9,7;"[illegible]
STOP TAPE - PRESS ANY K
EY";AT 9,7;"[illegible] LOADED"
3040 IF INKEY$="" THEN GOTO 3030
4000 REM ------INITIALISE-------
4010 FAST
4020 IF PEEK 16743<>VAL "90" THE
N RUN 7000
4030 LET DI=VAL "0"
4040 LET X=[illegible]
4050 POKE 16417,DI
4060 POKE 16418,DI
4070 DIM T$(4,28)
4080 LET T$(1)="[illegible]"
4090 LET T$(2)="[illegible]"
4100 LET T$(3)="[illegible]"
4200 REM -----"GOTO"-ARRAY------)
      (SET-UP THEN CHECK-SUM)
4210 DIM H(200)
4220 FOR N=1 TO 200
4230 LET H(N)=460
4240 IF N>154 AND N<167 THEN LET
 H(N)=290
4250 NEXT N
4260 LET H(1)=10
4270 LET H(9)=440
4280 LET H$=[illegible]
4290 FOR N=1 TO LEN H$ STEP 5
4300 LET H(1+CODE H$(N))=VAL H$(
N+1 TO N+4)
4310 NEXT N
4320 FOR C=1 TO 200
4330 LET X=X+H(C)*C
4340 NEXT C
4350 IF X<>[illegible] THEN PRINT "E
RROR-CHECK LINES 4200-4350";JDR
4360 RAND
4400 REM ------"M$"-RACK-------)
      (MESSAGES-AND-MARBLES)
4410 LET G$="[illegible]"
4420 LET M$="YOU HAVE LOST YOU
R MARBLES [illegible]"+G$+"[illegible]"
4430 LET M$=M$+G$+"[illegible]STAY COOL"+G$+"[illegible]"+G$+"FIRST[illegible]FRA
ME[illegible]"
5000 REM ----ANIMATED-INTRO----)
5010 LET X=6
5020 LET B$="[illegible]"
5030 PRINT AT [illegible] B$;AT 0,0;B$
5040 FOR N=1 TO 22
5050 PRINT "[illegible]"
5060 NEXT N
5070 SLOW
5080 PRINT AT 6,10;"[illegible]";TAB 11;
"[illegible]";TAB 10;"[illegible]";TAB 11;
"[illegible]";TAB 12;"[illegible]";AT 21,23;"J
DRHC"
5090 FOR T=1 TO 48 STEP 7
5100 LET M$="[illegible]PRESENT"( TO T+
6)
5110 POKE 16690,156-(5 AND T>24)
5120 POKE 16691,189-(30 AND T>24
)
5130 FOR N=X-12 TO 24+X STEP 2
5140 PRINT AT N-10,N;M$
5150 IF INKEY$=""(+USR 16660 TH
EN NEXT N
5160 PRINT AT 15,15;"[illegible]";T
AB 16;"[illegible]";TAB 17;"[illegible]"
5170 LET D$=INKEY$
5180 LET X=NOT X
5190 IF D$="" THEN NEXT T
5200 LET P$=B$([illegible] TO V+LEFT
) + [illegible] TO M+RIGHT [illegible]+B$
5210 PRINT AT 0,0;P$;AT 21,0;P$
5220 POKE 16690,148
5230 POKE 16691,152
5240 FOR X=1 TO 5
5250 FOR L=3 TO (19.5 AND D$=""
) STEP 1-RND
5260 PRINT AT L,USR 16680;"[illegible]
-PINBAT-[illegible]-PINBAT-[illegible]"
5270 IF INKEY$<>"" THEN GOTO 5170
5280 NEXT L
5290 IF D$<>"" THEN GOTO 600
5300 NEXT X
5310 GOTO 5030
7000 REM --------M-CODE---------)
         (DATA/LOADER/CHECKER)
7010 IF PEEK 16744<>18 THEN PRI
NT "1ST REM WRONG LENGTH";JDR
7020 POKE 16510,0
7030 LET D$="3A214006.22353A25.4
0C02006.21704022.29400100.08C03E
04.CD9A4052.3E81CD98.407BBA38.42
183728.3C4001C6.T=19714"
7040 LET D$=D$+"8208E512.2881032
8.21107000.2070C93A.2540FEFE.220
8FE7F.20180102.00294050.40112582
.19061856.2358722B.T=23107"
7045 REM
7050 LET D$=D$+"7323107F7.4600280
7.4811F302.19061855.2B5E7223.732
310F7.400CAD04.AC97B4AC.B5B7B4AC
.21044139E.25882003.T=27701"
7060 LET D$=D$+"351C2818.F0042F0
7.40115000.19110120.01604180.307
5057E.FE7A0A0.[illegible]10.FC357B30
.F2010000.C3824011.T=30070"
7065 REM
7070 LET D$=D$+"92041808.11.7151
7.03111110.2A0C4031.8600090.A80
17E8F.20017080.2021723.2EAF8051
.30F0C382.40008782.T=34421"
7080 LET LN=7030
7090 LET TT=0
7100 LET P=1
7110 FOR A=16514 TO 16739
7120 POKE A,16*CODE D$(P)+CODE D
$(P+1)-476
7130 LET TT=TT+PEEK A
7140 LET P=P+2+(D$(P+2)=".")
7150 IF D$(P)<>"T" THEN NEXT A
7160 IF STR$ (TT+A)<>D$(P+2 TO P
+6) THEN PRINT "ERROR:CHECK LINE
";LN;JDR
7170 LET P=P+7
7180 LET LN=LN+10
7190 NEXT A
7200 POKE 16743,90
7210 PRINT "OK:NOW SAVE + FEW CO
PIES"
9999 REM -----END-OF-PROG-----
```

(continued from previous page)

rather than two hands, it's much easier to control the bats. The wraparound can sometimes be used to advantage to quickly reach marbles on the opposite side of the screen. You score points by hitting stars or rollover targets — inverse numerals.

At sidewalls the marble obeys simple laws of reflection, but at stars or grey blocks the marble gets thrown off at a *random* angle. At "triboosters" the marble is deflected whichever way the tribooster characters are pointing at the time, and then a new tribooster, of random type, gets printed, this being essential to prevent the marble from ever getting stuck in an infinitely recurring pattern of bounces.

Physicists may like to note that with few exceptions marble motion is assumed to be Newtonian, frictionless, perfectly elastic and in zero gravity(!).

Main variables.

H(N)	'On Hit Goto' array.
X	Position of marble on screen (start of display file plus an offset).
DI	Direction of marble — 1 = right, 33 = down, etc.
M$	Messages and Marbles Rack
M	Pointer, keeping track of progress along M$.
BS	Bats.
SN	Screen number.
DEM	Demo mode if set to one, Play mode if zero.
D$	Demo select, input by player.
ANG	Angle of score display.
P$	Printing strings.
S$	Screen storage strings
D, A	Down/Across printing co-ordinates.
JDR	Undefined variable to stop program on errors.

Typed copies of this program are available for £2.50 from:

11 Carnarvon Road, Walton, Liverpool, L9 1EB. The cassette also includes two of our other ZX-81 games.

Line-by-line.

7	New direction is 33 or −33 to 'channel' marble straight up or down.
8	Reverses the newly picked direction in the case of the marble hitting the channeller directly from underneath.
10-40	Main loop. Line 40 is particularly efficient (see text).
50-110	Tribcosters. Three entry points for three different tribooster directions, but all return via 110 which prints a new tribooster of random type over the old one.
130-150	Dropgates. 130 swaps characters 137 and 138 to animate gate.
160-190	Sidewalls. Simple laws of reflection are obeyed e.g., at left wall, if collision is in south-west direction then DI = 32, rebound is south-east with DI equal to 34.
200-280	Flingers. Marble is thrown off at any of eight directions. To choose these at random a string is sliced which contains characters that will yield the required numbers — after 164 removed from them.
260	If chosen direction takes marble into a clear space then go back to main loop, if not, then stay in flinger routine until a clear route is chosen.
290-330	Rollover targets. Line 310 peeks the character and adds one to it thus incrementing the rollover number each time marble passes over it. The bracketed function resets nines to zeros.
420-430	This caters for the occasions when the marble hits the edge of the score display, causing the marble to run diagonally across it.
340-390	Bounces off bat. Bats are made from three different characters, each causing the marble to bounce off at a different angle.
400-418	Bonus routine.
460	Stops the program if marble hits an unspecified character, this especially protects against 'newlines' being poked and causing a crash. Program is routed to this line because all unspecified elements of the Goto array are filled with value 460.
440-450	Prints "lid" over launch channel when marble hits the — invisible — character 90 present onscreen just above the channel.
470-492	Marble lost. "Twinkles" marble where it hit the baseline.
600-620	Start new marble.
630-660	Moves the string M$, which contains "messages and marbles" across the bottom of the screen until either a marble character is detected whereupon the 'ready to launch' routine at 680-690 operates or a fullstop character is detected, which is used as a trigger for jumping to the "next screen" routine.
692-696	Slides a gate open at top of launch tube.
700-800	Miscellaneous decisions.
730-770	Game-over routine. Calls all the animation scans at once, until player decides to play again or go into demo mode.
800-820	Demo decisions.
860-880	Pokes "score store" bytes to character zeros.
900-992	Draws over and thereby erases old screen with a new one.
1000-1070	Select different strings containing draw instructions for screens 1-6
1100-1160	Extracts print co-ordinates from strings and passes these to draw subroutines.
2000-2480	Draw routines: 2010 draws whatever is in P$, 2030 draws a "channeller", 2090 draws a "rollover target", at 2400 there is a separate routine to draw all of screen 3 — bonus screen.
3000-END	Autosave /Initialisation/ presentation screen/machine code data, and loader.

MICROPRIDE LTD.

ORIC JOYSTICK

Suitable for use with Commodore 64, Vic 20 and Atari	£9.95
Top Fire Button and Side Fire Button Fast Action	
Interface for Oric 1/Atmos	£11.50
Interface for Spectrum ZX81	£7.95

TRACKBALL

Improve your scores and skills with the Computek Trackball. Suitable for use with Commodore 64, Vic 20 and Atari **£17.95**

Interface for Oric 1/Atmos **£11.50**

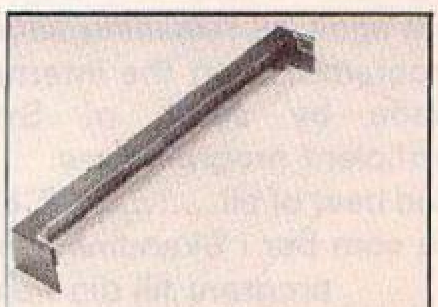
Interface for Spectrum ZX81 **£7.95**

COMPUTEK JOYSTICKS

For use with the BBC Computer. Metal shaft, 2 fire buttons **£12.95**

PM C16 CASSETTE DATA UNIT

Designed for use with Commodore +4, Commodore 64 and Vic 20. This cassette unit is a device for storing and recalling computer programs on ordinary cassette tapes. It can be used for saving programs you have written and want to recall for later use. It can also be used to read pre-recorded programs that you have purchased. **£24.95**



DUST COVER

Clips onto the back of the Commodore 64. Pivits up to allow use of keyboard, fully moulded, clear plastic dust cover. **£7.95**

TRADE ENQUIRIES WELCOME

ORIC ATMOS	£125.95
ORIC DISC DRIVE	£225.00
ORIC PRINTER	£129.95
ORIC MODEM AND INTERFACE	£99.95

Please send me the following ....

I enclose my cheque/P.O. made payable to:

MICROPRIDE LTD for £.....................

NAME ....

ADDRESS ....

....

* ALL PRICES INCLUDE POSTAGE & PACKING *

MICROPRIDE LTD.
UNIT 16, SHIPYARD INDUSTRIAL ESTATE,
BRIGHTLINGSEA, ESSEX CO7 0AR.

The Illustrator is imminent ....

Now you can add graphics to your Quill Written Adventure.
For use in conjunction with The Quill Adventure Writing System on the 48K Spectrum.

Please rush me an order form and full details of The Illustrator for the 48K Spectrum.
I enclose a stamped addressed envelope.

Name ....

Address ....

....

....

YC2

Send to;

GILSOFT
30 Hawthorn Road
Barry
South Glamorgan
CF6 8LE

THE VIKINGS ARE COMING!!!

SWESCOT are proud to announce that we will soon be releasing several top quality programmes on the international market, made by some of Sweden's most proficient programmers.

And best of all.........PRICES FROM £1.99

Du som bor i Skandinavien och söker bra program till din hemdator.

KONTAKTA OS!!!

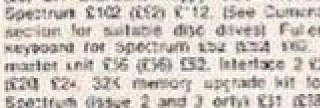
Vi har det mesta som finns i denna tidning till *samma* laga priser som gällor i England. Dessutom far vi in alla nyheter *samtidigt* som de släpps i England.

OBS!!! Vid katalogbeställning v.g. medsänd 5: – Skr i frimärken för portot.

SWESCOT

Box 213
121 02 Johanneshov
Sweden
08/39 27 00 – 08/81 18 01

ORIC AND SINCLAIR COMPUTERS



Oric 1 computer 48K £85 (£82) £92. Oric Atmos computer 48K £171 (£158) £168. Oric colour printer £134 (£123) £149. Sinclair flat screen TV £113 (£105) £115. Sinclair Spectrum Plus Computer £182 (£174) £187. Sinclair QL Computer £406 (£385) £410. Sinclair Spectrum 48K £13' (£131) £143. Microdrive £51 (£50) £60. RS232 interface 1 £51 (£50) £60. Special offer: Microdrive + Interface 1 + 4 cartridges £102 (£100) £120. Blank microdrive cartridges £5.50 (£6) £7. Standard floppy disc interface for Spectrum £102 (£92) £112. (See Cumana disc section for suitable disc drives) Fuller FDS keyboard for Spectrum £52 (£54) £60. Fuller master unit £56 (£36) £52. Interface 2 £20.45 (£20) £24. 32K memory upgrade kit for 16K Spectrum (issue 2 and 3 only) £31 (£28) £30. Spectrum Centronics printer interface £51 (£47) £52. ZX printer has been replaced by the Alphacom 32 £71 (£69) £82. 5 printer rolls (state whether Sinclair or Alphacom) £13 (£16) £21. ZX computer £45 (£44) £54. 16K ram packs for ZX81 £26 (£25) £30.

COMMODORE COMPUTERS

Commodore C16 Starter Pack £143 (£142) £162. Commodore Plus/4 £305 (£281) £301. Commodore 64 £222 (£215) £235. Convertor to allow most ordinary mono cassette recorders to be used with the Vic 20 and the Commodore 64 £9.75 (£9) £11. Bargain package: cassette convertor + compatible cassette recorder £37 (£38) £44. Commodore cassette recorder £43 (£44) £50. Printer interfaces for Vic20 and the Commodore 64 Centronics £45 (£41) £46, RS232 £45 (£41) £46. Disc drive £233 (£206) £231. 1520 printer/plotter £165 (£149) £166. MPS801 Printer £235 (220) £245. Light pen £29 (£29) £33.

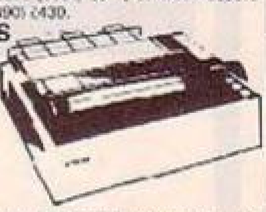
ACORN COMPUTERS

Electron £173 (£170) £199. BBC Model B £404 (£357) £397. tends double density disk interface system £149 (£131) £141. See below for suitable disc drives.

CUMANA DISC DRIVES

To suit disc interfaces of Sinclair Spectrum, BBC B and Videogenie. Single: 40 track single sided £178 (£158) £178, 40 track double sided £218 (£195) £215, 80 track single sided £207 (£186) £206, 80 track double sided £224 (£209) £229. Dual: 40 track single sided £299 (£280) £320, 40 track double sided £395 (£353) £393, 80 track single sided £372 (£334) £374, 80 track double sided £437 (£390) £430.

PRINTERS



Oki Microline 80 £138 (£135) £164. Brother HR5 £162 (£146) £170. Shinwa CT CP-80 £237 (£228) £258. Cannon PW1080A £362 (£344) £374. Epson RX80 £277 (£251) £282. Epson RX80F/T £314 (£286) £316. Epson FX80 £399 (£358) £386. Combined matrix printers and electric typewriters: Brother EP22 £173 (£166) £186, Brother EP44 £256 (£235) £260. MCP40 Oric Colour printer/plotter £134 (£123) £140. Interfaces to run the above printers from Vic and the Commodore 64 £45 (£41) £46. We can supply interfaces to run the above printers from Sharp computers £50 (£53) £55.

UK101, SUPERBOARD AND VIDEOGENIE

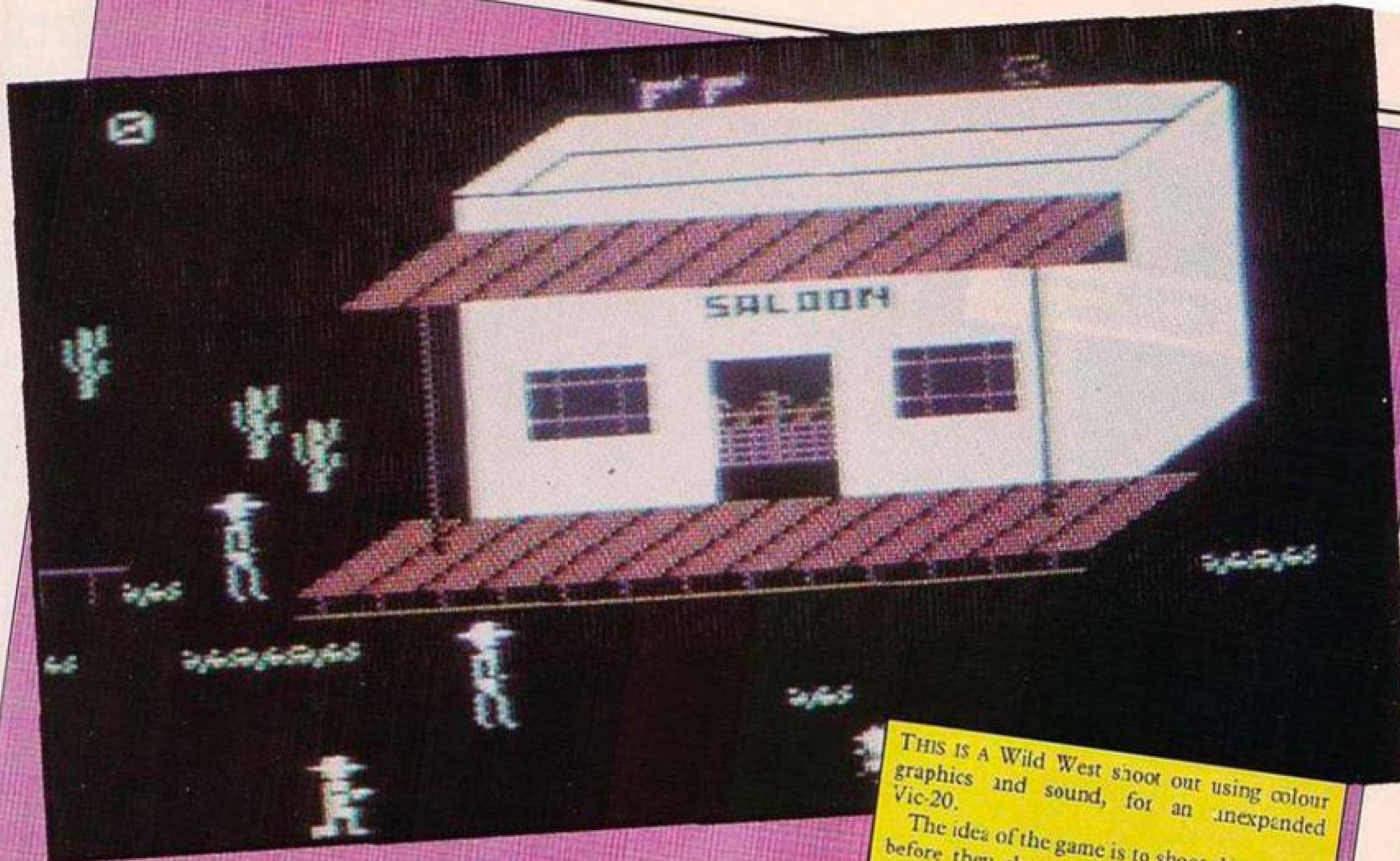
We still support these Computers. Write for our list.

COMPUTER REPAIRS

We offer a world-wide repair service. Write for a quotation.

SWANLEY ELECTRONICS
The Computer Export Specialists.
Dept YC, 32 Goldsel Rd., Swanley, Kent BR8 8EZ, England.
Tel: SWANLEY (0322) 64851.

Official orders welcome. UK prices are shown first and include post and VAT. The second price in brackets is for export customers in Europe and includes insured airmail postage. The third price is for export customers outside Europe including Australia etc and includes insured airmail postage.



VIC GUN FIGHT

THIS IS A Wild West shoot out using colour graphics and sound, for an unexpanded Vic-20.

The idea of the game is to shoot the outlaws before they shoot you. Points are given for each one you shoot, the faster your reactions, the more points you receive. You will lose points if you shoot the moving unarmed man. Use any key to shoot, beware of the snake!

Program 1.

Program 2.

This program is available on the Telsoft service.

SPRAYMAN

Julian Wood, with the help of an STS, rids the Spectrum of bugs — the creepy crawly kind.

SOMETHING I'VE always wanted is my very own Spray Test Simulator or STS. Having waiting for over two years for one to be released on the Spectrum, I decided to write one myself.

This particular STS is equipped with three different sprays designed to eliminate three different types of creature, plus another spray which disintegrates TNT. Your aim is to give these sprays the fair test they deserve. Your score will indicate whether you have the skill to become a professional STS operator — a score of a million is just about good enough! Spraymania runs on any ZX-Spectrum, and features smooth, colourful animated graphics and a lot of sound.

To enter Spraymania, first type in the Basic header program in listing 1, and save it using:

SAVE "SPRAYMANIA" LINE 0

In case you were wondering the

RANDOMIZE 51707

statement is essential. Also, the Border 1 statement is important.

Then type in the machine-code loader program in listing 3 and Run it. Enter each byte as shown in listing 2, taking care to check the checksum after entering each line. If you make a mistake in a line, enter 999, and a beep will sound, and you can enter that line again. If you enter a byte which is obviously wrong less than 0 or greater than 255 — another tone will sound, and you can then enter the correct byte. When you have entered all the machine-code, and the checksum is correct, save the code after the leader program, using

SAVE "C" CODE 25000, 3400

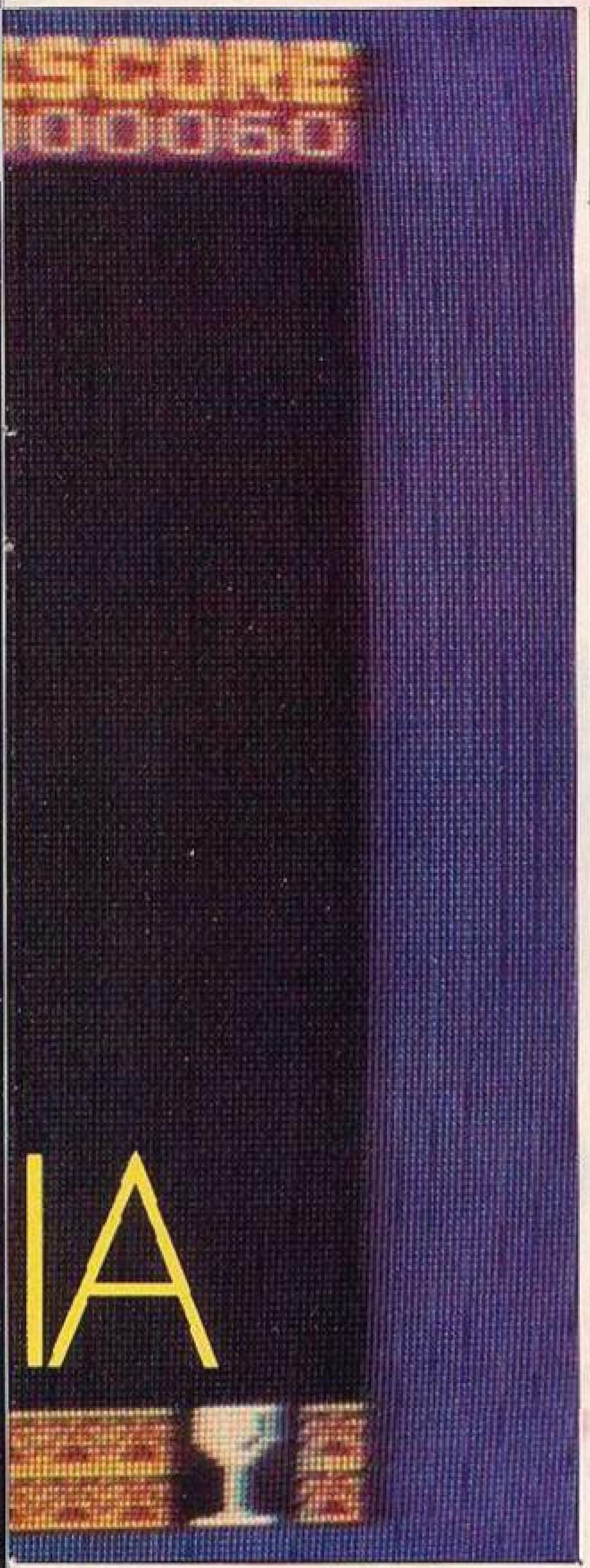
Rewind the cassette and load the game.

On running, the program goes into demo mode, during which brief instructions — including the control keys — scroll smoothly across the screen. On pressing a key, the game starts with your spray-can appearing at the centre of the screen. At the bottom of the screen are the various sprays, and a bonus box in which the bonus appears every so often. To collect a spray, or the bonus, simply move your can over the relevant box.

- Whirlers (bounce around the screen like balls) = 50
- Gruesomes (vertically-moving faces) = 10
- Globules (move horizontally) = 25
- TNT = 100
- Bonus = 250

Unlike the moving creatures the TNT doesn't kill on touch but gradually changes colour until it becomes white and explodes.

For a copy of Spraymania on cassette, send a cheque or postal order for £1.90, to: Mr J.R Wood, 22 Denver Hill, Downham Market, Norfolk, PE38 9BE.



Listing 1.

```
  10 PAPER 1: INK 1: BORDER 1: C
LEAR 24999: PRINT AT 11,5; FLASH
 1; PAPER 7;"SPRAYMANIA IS LOADI
NG": LOAD ""CODE : RANDOMIZE 517
07: PRINT USR 28187
```

Listing 3.

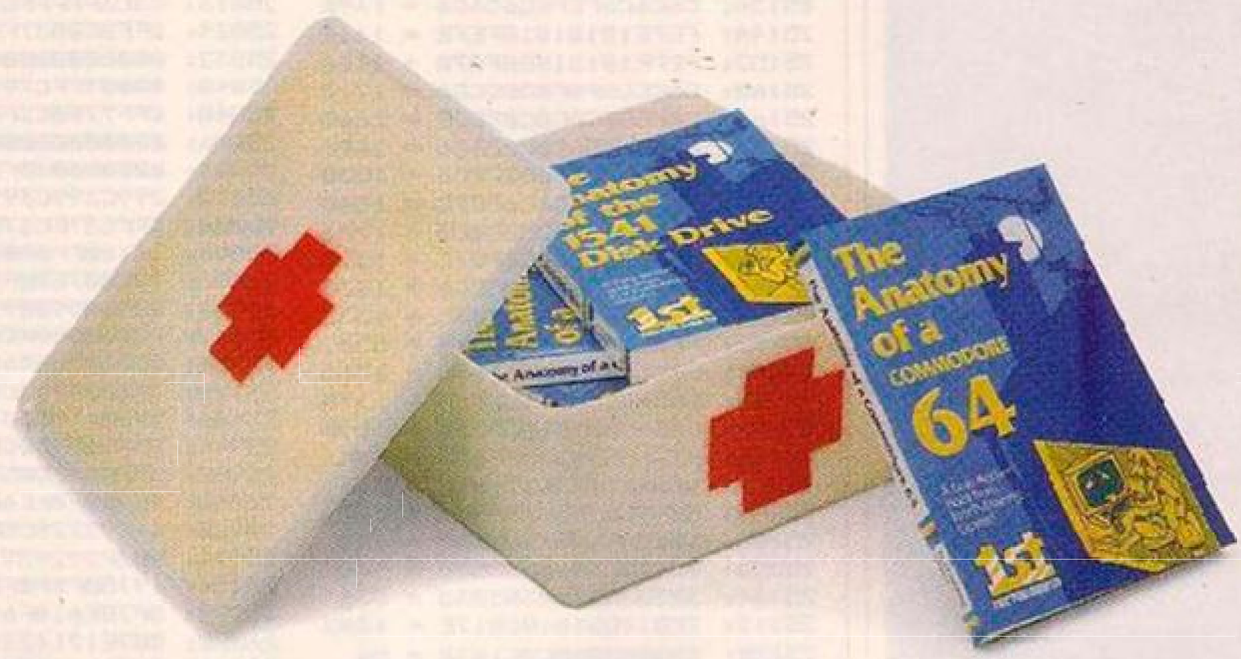
```
   5 REM  spectrum hex loader
  10 DEF FN a(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2
)-48-(7 AND h$(2)>"9")
  20 INPUT "start ";s
  30 INPUT "finish ";f
  40 FOR n=s TO f STEP 8
  50 LET tot=0
  60 PRINT n;" ";
  70 INPUT h$: PRINT h$;
  80 FOR b=1 TO LEN h$ STEP 2
  90 LET z=FN a(h$): LET tot=tot
+z
 100 POKE n+b,z
 110 LET h$=h$(3 TO )
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
 error - try again": GO TO 50
 150 NEXT n
 160 REM Enter STOP to stop
```

Listing 2.

```
25000: 007CC6C6C6C67C00 = 1040
25008: 001838781818FF00 = 502
25016: 007C86067CC0FE00 = 834
25024: 007C863C06867C00 = 582
25032: 00C0D8D0FE181800 = 926
25040: 00FEC0FC06867C00 = 962
25048: 007CC0FCC6C67C00 = 1088
25056: 00FE060C18303000 = 392
25064: 007CC67CC6C67C00 = 966
25072: 007CC6C67E067C00 = 776
25080: 7CFEC6C6FEFEC6C6 = 1678
25088: FCFEC6FCFEC6FEFC = 1914
25096: 7CFEC6C0C0C6FE7C = 1536
25104: F8FCCEC6C6CEFCF8 = 1808
25112: FEFEC0FCFCC0FEFE = 1904
25120: FEFEC0FCFCC0C0C0 = 1780
25128: 7CFEC0DEDEC6FE7C = 1590
25136: C6C6C6FEFEC6C6C6 = 1696
25144: FEFE181818180FEFE = 1112
25152: FEFE181818D8F870 = 1156
25160: C6CCD8F0F0D8CCC6 = 1716
25168: C0C0C0C0C0C0FEFE = 1660
25176: C6EEFED6C6C6C6C6 = 1696
25184: C6E6F6FEFEDECEC6 = 1808
25172: 7CFEC6C6C6C6FE7C = 1540
25200: FCFEC6FEFCC0C0C0 = 1786
25208: 7CFEC6D6DECEFE7C = 1596
25216: FCFEC6FEFCD8CCC6 = 1828
25224: 7CFEC0FC7E06FE7C = 1332
25232: FEFE181818181818 = 652
25240: C6C6C6C6C6C6FE7C = 1566
25248: C6C6C6C6C66C3810 = 1170
25256: C6C6C6D6D6D6FE6C = 1598
25264: 82C66C38386CC682 = 984
25272: 6666667E3C181818 = 564
25280: FEFE0E1C3870FEFE = 1226
25288: 303030180C000000 = 180
25296: 0C0C0C1830000000 = 108
25304: 3838380000383838 = 336
25312: 7E81EDB1B1BD817E = 1242
25320: 000000000C0C1830 = 96
25328: 0000000000000000 = 0
25336: FF886BD5B663C1FF = 1440
25344: 0000183C3C180000 = 168
25352: 07E01FF83DBC718E = 1014
25360: 63C6E5A7C993FFFF = 1551
25368: FFFFC993E5A763C6 = 1551
25376: 718E3DBC1FF807E0 = 1014
25384: 07E01FF83C7C706E = 915
25392: 63C6F4E7FED3CF93 = 1591
25400: C9F3CB7FE72F63C6 = 1349
25408: 760E3E3C1FF807E0 = 764
25416: 07E01FF83C3C781E = 780
25424: 7FFEEE77CFF3CBD3 = 1602
25432: CBD3CFF3EE777FFE = 1602
25440: 781E3C3C1FF807E0 = 780
25448: 07E01FF83E3C760E = 764
25456: 63C6E72FCB7FC9F3 = 1349
25464: CF93FED3F4E763C6 = 1591
25472: 706E3C7C1FF807E0 = 916
25480: 07E00CF01FF8318C = 951
25488: B9CDB9CDF18FFFFF = 1674
25496: B7EDAE753A5C324C = 987
25504: 381C1C380FF003C0 = 618
25512: 07C00C701FF0310C = 825
25520: 35ACB5ADF18FFFFF = 1473
25528: BE7D37EC2E74381C = 852
25536: 3C3C1FF80FF003C0 = 849
25544: 07E00F301FF8318C = 762
25552: 339C339CF18FFFFF = 1308
25560: 3E7C3E7C37EC2C34 = 759
25568: 3FFC1FF80FF003C0 = 1044
25576: 3FFC3FFC334C0340 = 824
25584: 03400340FFFFC183 = 968
25592: FFFFC5A3ECB7ED37 = 1581
25600: EDB7FFFFD818FFFF = 1683
25608: 000000003FFC3FFC = 630
25616: 334C0340FFFFC663 = 1001
25624: FFFFC5A3ECB7ED37 = 1581
25632: EDB7FFFFC663FFFF = 1737
25640: 0000000000000000 = 0
25648: 3FFC3FFCFFFFD818 = 1383
25656: FFFFC5A3ECB7ED37 = 1581
25664: EDB7FFFFC183FFFF = 1764
25672: 07FE0FFE033007B0 = 764
25680: 069006880EC01F60 = 625
25688: 1FA01FA01FA01FA0 = 764
25696: 1FA01FA01FA01FE0 = 828
25704: 3000380006000180 = 239
25712: 00602A98FFFE924A = 1019
25720: FFFEFFD730AB9CD7 = 1649
25728: 9CAA80D6FFFEFFFE = 1686
25736: 1FF81FE81FE81FE0 = 1060
25744: 1FD80FB007E003C0 = 864
25752: 0180018001800180 = 516
25760: 018001800 3C01FF8 = 732
25768: 6000700030003000 = 304
25776: 31FC33FE7B06FFFF = 1245
25784: FFFFC923DB6BC928 = 1316
25792: DDABC923FFFFFFFF = 1648
25800: 300CC813C4230420 = 546
25808: 7FFEC3C399999999 = 1383
25816: C3C3FFFFFC3F8E71 = 1470
25824: DFFBC0037FFE3FFC = 1365
25832: 0000000000000000 = 0
25840: 00003FFC799EF99F = 1002
25848: EFF7700E3FFC0000 = 927
25856: 0000000000000000 = 0
25864: 000000020FF01FFB = 534
25872: 399C399C399C3FFC = 954
25880: 3FFC37EC37EC37EC = 1188
25888: 18180FF000000000 = 303
25896: 03C007E00FF00990 = 834
25904: 0990099009900FF0 = 714
25912: 0DB00DB00DB00DB0 = 756
25920: 0DB00DB0066003C0 = 675
25928: 7FE07FF00CC00DE0 = 1159
25936: 0960116003700 6F8 = 587
25944: 05F805F805F805F8 = 1012
25952: 05F805F805F807F8 = 1014
25960: 7C0F0F0FE603F658 = 736
25968: 67C93E28C5E5D526 = 1086
25976: 006F292929 11A061 = 508
25984: 19780F0F0FE6E0E1 = 821
25992: 5F7BE618F6405706 = 872
26000: 087E12142310FAD1 = 682
26008: E1C1C92100403E5B = 869
26016: 360023BC20FAC921 = 793
26024: 00580620722C10FC = 552
26032: 0620732C10FCC926 = 704
26040: 4006032E20CB162D = 426
26048: 20FBCB162410F4C9 = 1005
26056: 21CC650101007EB7 = 650
26064: C8CD74650C2318F6 = 939
26072: CDE76521015B35C0 = 859
26080: 3608ED5B025B1A13 = 528
26088: CB7F280511EC66EE = 968
26096: 804804CD7465ED53 = 946
26104: 025BC91118FCCD10 = 808
26112: 66119CFFCD10561E = 883
26120: F6CD10667D3C1807 = 785
26128: AF193C30FCED5206 = 893
26136: 01CD74650CC92A04 = 682
26144: 5B3A065B0E001911 = 302
26152: 1027CD5230063C32 = 546
26160: 065B1801192204 5B = 276
26168: E56F2600CD0166E1 = 911
26176: CDFB65C9E5CD1E66 = 1324
26184: E1C9790F0F0F4F79 = 792
26192: 0F0F4F3E100878A7 = 482
26200: 1F371FA71FA8E6F8 = 961
26208: A86779A8E6C7A807 = 1164
26216: 076F1AAE772C131A = 526
26224: AE771304083D20DD = 638
26232: C9CD686511E1FF78 = 1228
26240: 0602E6073A005828 = 434
26248: 0104772D771910FA = 579
26256: C93A0758 0E0CCD0D = 601
26264: 66C92A035B260016 = 504
26272: FF0E13CD0766C92A = 845
26280: 095B3A085B0E19CD = 504
26288: 3866C9111756CDA7 = 857
26296: 65CDC86511 0000CD = 829
26304: 1E66CD9166CD9A66 = 1045
26312: CDA766C91D0D191C = 770
26320: 0F2A2A2A2A161320 = 256
26328: 0F1D2A2A2A1E1317 = 242
26336: 0F2A2A2A12131D0D = 220
26344: 191C0F00251D1A1C = 188
```

(continued on page 65)

FIRST AID



for your 64

Computers, like people, are fallible. They need the right combination of code and care to perform effectively in the business or the home. And that requires first hand knowledge from you to create a healthy operating environment for your Commodore 64.

Knowledge about machine language, about the lesser known qualities of the 64, about the disc drives, graphics, and about the tricks and tips to keep your 64 on line. That's why First Publishing has now launched in the UK a series of high quality books and software packages to provide a complete health care kit for your 64. Commodore 64 users throughout Europe have already found it a tonic. We think you will, too.

For a brochure on all the Commodore 64 books and software packages available from First Publishing, please fill in the coupon and send to: Amanda York, First Publishing, Unit 203, Horseshoe Road, Horseshoe Park, Pangbourne, Berkshire.

Name ______________________

Address ______________________

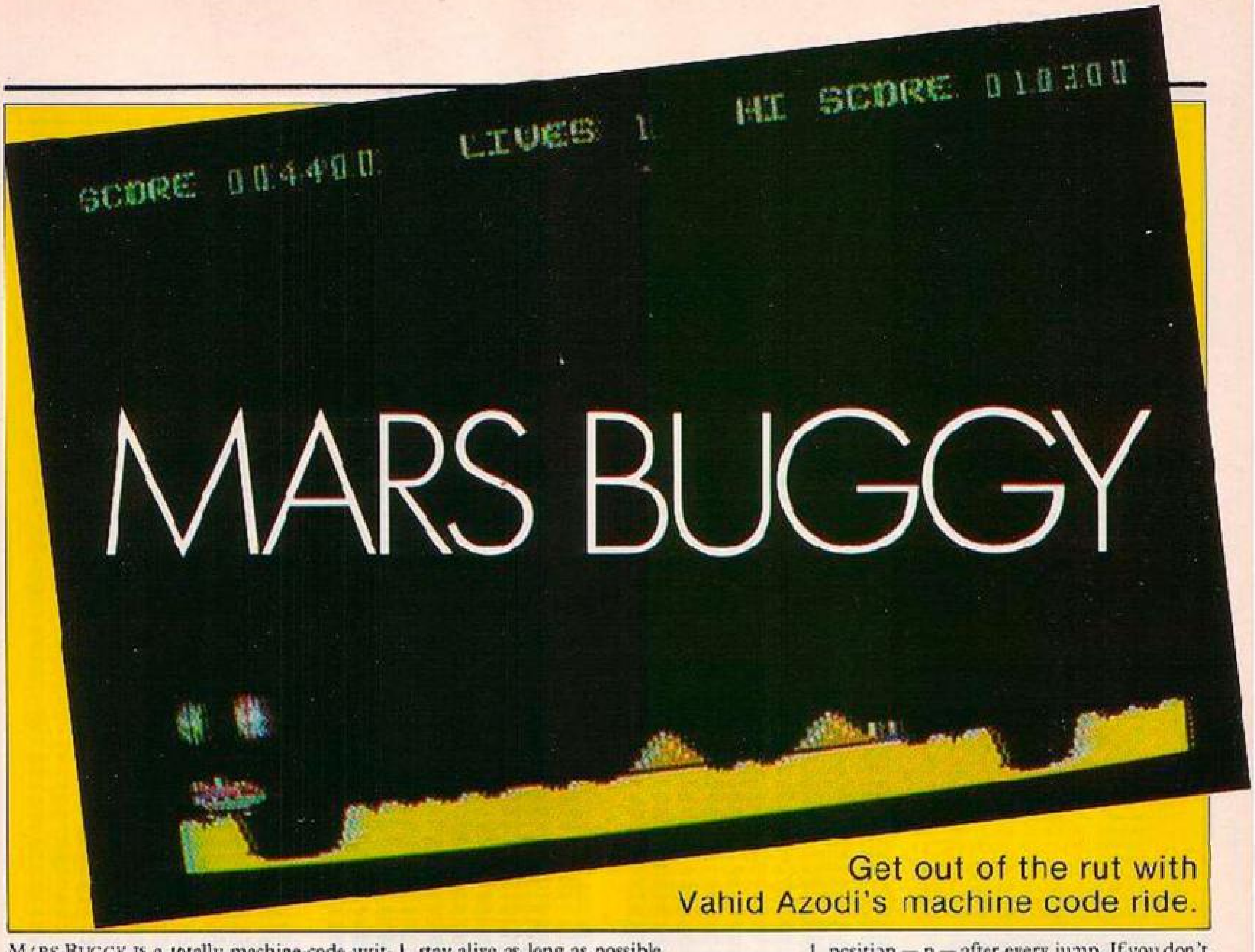
____

Or ring *Amanda York* at (07357) 5244 or Calco Software at 01-546 7256 YC/2

1st FIRST PUBLISHING LTD

(continued from page 63)

```
26352: 0B23170B18130B26 = 172
26360: 272A282A020A0706 = 190
26368: 292A141F16130B18 = 210
26376: 2A1C0F2A2119190E = 224
26384: 2C0D19181E1C1916 = 211
26392: 2A150F231D27251B = 245
26400: 262A1F1A29252426 = 289
26408: 2A0E19211B292519 = 241
26416: 262A160F101E2925 = 241
26424: 1A262A1C1311121E = 218
26432: 29251D23170C1916 = 224
26440: 2A1D1213101E262A = 234
26448: 10131C0F29251E19 = 211
26456: 1A2A1C1921262A10 = 250
26464: 1C0F0F240F290B18 = 185
26472: 232A191E120F1C2A = 235
26480: 150F232A1E192A1C = 238
26488: 0F1D1E0B1C1E2C1C = 215
26496: 0F170F170C0F1C27 = 170
26504: 1E120F2A1B1F130D = 195
26512: 152A0C1C1921182A = 227
26520: 1019222A141F171A = 217
26528: 1D2A19200F1C2A1E = 243
26536: 120F2A160B24232A = 221
26544: 0E19112C1A1C0F1D = 198
26552: 1D2A0B18232A150F = 219
26560: 232A1E192A1A160B = 233
26568: 23AC110B170F2A19 = 340
26576: 200F1C00CDEE6704 = 625
26584: CDEE67C925CD6865 = 1194
26592: 3A005E772C7711E0 = 672
26600: FF19772D77C9780F = 899
26608: 0F0FE6E0B16F78E6 = 1122
26616: 18F64067C5060B1A = 674
26624: AE77132C1AAE772D = 720
26632: 241310F3C1C92100 = 741
26640: 0055C5E5D5CD426D = 1104
26648: D1E1E5D57D2F6FCD = 1364
26656: 126DD1E1C1784209 = 997
26664: 47BC20E6C9210C5B = 658
26672: 7E32145B3A205BCB = 671
26680: 5F200034CD4ECOCD = 071
26688: DF180435C0CB9F32 = 908
26696: 205BC9E52A0D5B23 = 734
26704: CB6C280226002200 = 438
26712: 5B7E24B62486E1C9 = 983
26720: 79E607CA4A66680F = 855
26728: 47673E010F0F10FC = 535
26736: 453D6F220F5B7907 = 509
26744: 07074F3E100878A7 = 466
26752: 1F371FA71FA8E6FB = 961
26760: AB6779ABE6C7AB07 = 1164
26768: 076F04C51A47131A = 461
26776: 13D558ED4B0F5B0F = 753
26784: 0FC30BCB0B10F857 = 794
26792: 7BA1AE772C792FA3 = 952
26800: 5F7AA1B3AE772C79 = 1015
26808: 2FA2AE77D1C1083D = 973
26816: 20DDDCC7CA7766CD = 1230
26824: 686578E6073A005B = 711
26832: 060211E2FF280104 = 551
26840: 772D772D771910FB = 736
26848: C921C05A36162C20 = 668
26856: FB0516CDEF68040E = 845
26864: 00CD72651E040C0C = 478
26872: 16050CCD72651520 = 512
26880: F91D20F20C0C0CCD = 793
26888: 7265C9C5CDD467CD = 1338
26896: DC67C179C6074F21 = 954
26904: 005B34C93E043200 = 460
26912: 5B010116110B63CD = 444
26920: 0B6911AE63CD0B69 = 721
26928: 112B65CD0B6911EB = 728
26936: 63CD0B69364721FD = 831
26944: 5ACDE067C9061070 = 957
26952: 23CD4B68E60F0777 = 790
26960: 2336814FC3BA6AC9 = 985
26968: CD4B68E6073C0777 = 807
26976: 230E007123360247 = 452
26984: C3056BC9CD4B68E6 = 1122
26992: 073C0777230E1E71 = 385
27000: 4723368OFE0AD295 = 911
27008: 6B34C3956BCD4B68 = 994
27016: E60FC603774723CD = 876
27024: 4368E60F07774F23 = 664
27032: 3681C3CB6B3E0132 = 801
27040: 015B32125B32205B = 424
27048: 21EC6622025BCDB8 = 887
27056: 69110907CDA765C9 = 812
27064: AF320C5D21115D36 = 523
27072: 3223233601237723 = 364
27080: 3601237723773210 = 442
27088: 5B21215B772B7EE6 = 766
27096: 05772B3600216853 = 449
27104: 22185E3E3C32085B = 420
27112: CD9B65CDE168CD1C = 1228
27120: 69CD1A6AC9210000 = 676
27128: 22095B220A5B2A78 = 431
27136: 5C220D5B3E25F3ED = 809
27144: 47ED5EFBC921045B = 982
27152: AF77237723772336 = 691
27160: 03C921685B061836 = 516
27168: 002310FBC921115B = 644
27176: 35C03A32EBCD4B6D = 973
27184: 21085B35EB237E23 = 616
27192: 35C07721175B7E34 = 689
27200: CB962A185B2323CB = 783
27208: 7ECC576A23CB7D23 = 926
27216: 022E6822185BC92B = 545
27224: 2BA7CA6C693DCA45 = 957
27232: 693DCA5869E5211F = 854
27240: 5B7EB7200ACD4B6B = 826
27248: E6033C77CD066EE1 = 958
27256: C385693A145B0F0F = 632
27264: 0F16005F19EBC9E5 = 822
27272: 218863CD7B6AC5CD = 1104
27280: 4F66C1E1CD1F6C11 = 960
27288: 0A00DA4466201DCB = 662
27296: 46280A043EA0E820 = 562
27304: 0CCB861808053E10 = 464
27312: BB2002CBC62B2B70 = 817
27320: 23233E0532005B3A = 336
27328: 0C5BE5C5218863CD = 1002
27336: 7E6ACD4F66CD7966 = 1046
27344: C1E11E01C3246BE5 = 1016
27352: C521E864CD7B6ACD = 1201
27360: D467C1E1CD1F6C11 = 1094
27368: 1900DA44662018CB = 672
27376: 4E280A0C3E1EB920 = 449
27384: 07CB8E18050D2002 = 430
27392: CBCE2B71233E0632 = 718
27400: 005BE5C521E8643A = 940
27408: 0C5BCD7E6ACDD467 = 1060
27416: CDDC67C1E11E0278 = 1098
27424: 07070747CD2F6B79 = 572
27432: 0707074FC3026C3A = 463
27440: 1E5BBBC0CB76C0ED = 1250
27448: 5B1C5B7B913CFE04 = 796
27456: D07A90FE10D07EF6 = 1324
27464: 5C77C9E5C53A215B = 1020
27472: 210B63CD7E6ACDD4 = 994
27480: 67C1E1CD1F6C1132 = 932
27488: 00DA44662031CB46 = 742
27496: 280A043E14B8200C = 364
27504: CB861808053E02B8 = 622
27512: 2002CBC6CB4E280A = 766
27520: 0C3E1EB92009CB8E = 675
27528: 18050D2002CBCE2B = 528
27536: 712B7023233E0432 = 454
27544: 005BE5C5210B633A = 715
27552: 165BCD7E6ACDD467 = 1070
27560: CDDC67C1E11E00C3 = 1171
27568: 1F6BE5C521EB63CD = 1135
27576: 7B6ACDD467C1E1CB = 1370
27584: 76CBBE116400C244 = 890
27592: 66CBFEE5C53A115B = 1151
27600: 3D7E200D3CFE8820 = 714
27608: 083DEB21205BCBCE = 869
27616: EB77E60732005B3A = 790
27624: 0C5B21E863CD7E6A = 904
27632: CDD467CDDC67C1E1 = 1466
27640: 7B070707471E03C3 = 440
27648: 2F6BED5B1A5B7A90 = 865
27656: 30012FFE10D07B91 = 842
27664: 30012FFE10D03A20 = 664
27672: 5BCBCF32205BC97E = 1001
27680: 0F0FE607C8ED5B11 = 812
27688: 5BCB43C03DF50707 = 873
27696: 5F7EE6C3B377EBCD = 1384
27704: 4B6DEBF1C0CBBE37 = 1300
27712: C921155B35C03604 = 649
27720: 23CD506CCD2D68C9 = 983
27728: 343E04BEC03600C9 = 755
27736: 2346234E23CB7EC9 = 783
27744: 2167590602C5CD58 = 725
27752: 6CC4436BCD586CC4 = 1083
27760: 876ACD586CC4D76A = 1159
27768: CD586CC4B26BC110 = 1091
27776: E43A0C5B32145B3A = 608
27784: 165B32215BC9AF32 = 713
27792: 1E5B32205B017858 = 503
27800: ED431A5BCDAB6CCD = 1110
27808: C4680101011E02CD = 540
27816: 0E68C9ED4B1A5B11 = 765
27824: 48653A205BCB5728 = 684
27832: 031148643A1E5BC6 = 569
27840: 4432005BCD6068C9 = 815
27848: CDAB6CED5B1A5B21 = 962
27856: 205B01FEDFED781F = 989
27864: 380B477BFEF07828 = 915
27872: 041C1CCBD61F3808 = 572
27880: 1C1D28041D1DCB96 = 512
27888: 06FBED781F38077A = 830
27896: FE10280215154 1ED = 656
27904: 781F1F38077AFEA0 = 781
27912: 28021414ED531A5B = 519
27920: D5CDAB6CCDC468D1 = 1411
27928: 7AFEA0C07BFEE8CA = 1539
27936: EB6D2604D6082806 = 654
27944: 25C8D63820FA253E = 888
27952: 0394211E5BBEC877 = 814
27960: 6B2601111400CD42 = 454
27968: 6DC9CDB60321205B = 856
27976: CBA6C921205B7EEE = 1090
27984: 1077E610F609D3FE = 1101
27992: C901FEF7ED7B2FE6 = 1337
28000: 1FC006FFED7B2FE6 = 1102
28008: 1FC9241C5B7CA71F = 715
28016: 371FA71FACE6F8AC = 1106
28024: 577D0F0FACE6C7AC = 1015
28032: 07075F1A2F12C92A = 443
28040: 1C5B7CB7CBCD4B6D = 1015
28048: CD6A6D3A205B2DCB = 849
28056: 6F28022C2C7DFE20 = 652
28064: 2815FEFF2811221C = 689
28072: 5DCD6A6DEDCD6065 = 1156
28080: 3A225BC60477C9AF = 880
28088: 321D5BC901FE7FED = 990
28096: 78CB4FC03A1D5BA7 = 939
28104: C03A1E5B32225B2A = 588
28112: 1A5B7D0F0F0FE61F = 548
28120: 6F24221C5BCD6A6D = 720
28128: 21205BCBAECB56C8 = 1022
28136: CBEEC93A1F5BB7C8 = 1205
28144: 11FA00CD4466CD06 = 853
28152: 6E010A011E00CD0E = 371
28160: 68AF321F5BC93E47 = 785
28168: 3200583A1F5B2148 = 426
28176: 64CD7E6A011D16CD = 794
28184: D467C9CDF569CD9D = 1433
28192: 693A205B1F76300E = 497
28200: AFDBFE2FE61FC2D7 = 1365
28208: 6ECDD8651825CDC8 = 1098
28216: 6CCD9A663A085BA7 = 893
28224: CAC76ECDBC6DCD87 = 1353
28232: 6DCD596D280DCD59 = 859
28240: 6D20FBAFDBFE2FE6 = 1317
28248: 1F28FBCD416CCD25 = 939
28256: 6ACD606C3A205B1F = 727
28264: 38B71F30B4010A01 = 510
28272: 1E05CD0E6821075B = 489
28280: 352064CD9166210B = 681
28288: 5B3A065BBE38172A = 557
28296: 045B2009ED5B095B = 564
28304: ED52193809220958 = 543
28312: 320B5BCDA76621CA = 861
28320: 67010B0BCDCE6506 = 644
28328: 07C5216B593E0890 = 647
28336: 0609772C10FC0164 = 547
28344: 0A1E01CD0E68C110 = 573
28352: C07610FDC31E6E01 = 955
28360: 05081E00CD0E6821 = 399
28368: 125B35280B1808CD = 447
28376: 0D6A21125B3605CD = 525
28384: B869CDB366061E76 = 929
28392: 10FDCD8E6CC3216E = 1062
```



MARS BUGGY

Get out of the rut with Vahid Azodi's machine code ride.

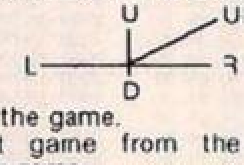
MARS BUGGY is a totally machine-code written game for the Commodore 64 and includes the following features:

- Raster interrupt driven smooth scrolling.
- Multi coloured sprites.
- Very fast and flexible control of buggy — space ship.
- Score and high score feature.

If you have not seen the game in the arcades here is a brief description. You control a buggy which can jump and fire bullets in horizontal and vertical directions.

The game is played on a scrolling screen which scrolls from right to left you have three lives at the beginning of the game and one life is deducted every time you fall into a ditch or hit a rock or get hit by a bullet from the space ships — enemies. The object of the game is to stay alive as long as possible.

You control your ship with a joystick only. Sorry keyboard freaks. The controls are:



F1 Pause the game.
F2 Restart game from the middle of another game.
* When the game is paused you restart the game by moving the joystick.
U Makes the buggy jump upwards.
UR Makes buggy jump up and forwards.
R Keeps buggy steady on the screen.
L Makes buggy go quickly to the left.

If the buggy is made to jump it will not be able to jump up again straight away so don't panic.

So always bring the joystick to the neutral position — n — after every jump. If you don't, the buggy's wheels will lock and will not be able to jump.

Entering the game is very simple, just type in the program like a Basic game. Then remember to save it before you run it. When run the program displays the title screen and asks you to wait a while for the game to load. Be patient because it's a long wait. The instructions on the screen telling you to wait will change to — press fire to start. Put the joystick into port 2 and press the fire button and hey presto — the game starts.

If you don't want to type in the program there is a cassette available for £3.00 inc. postage and packing from: Mars Buggy, 22 Lorton House, West End Lane, London, NW6.

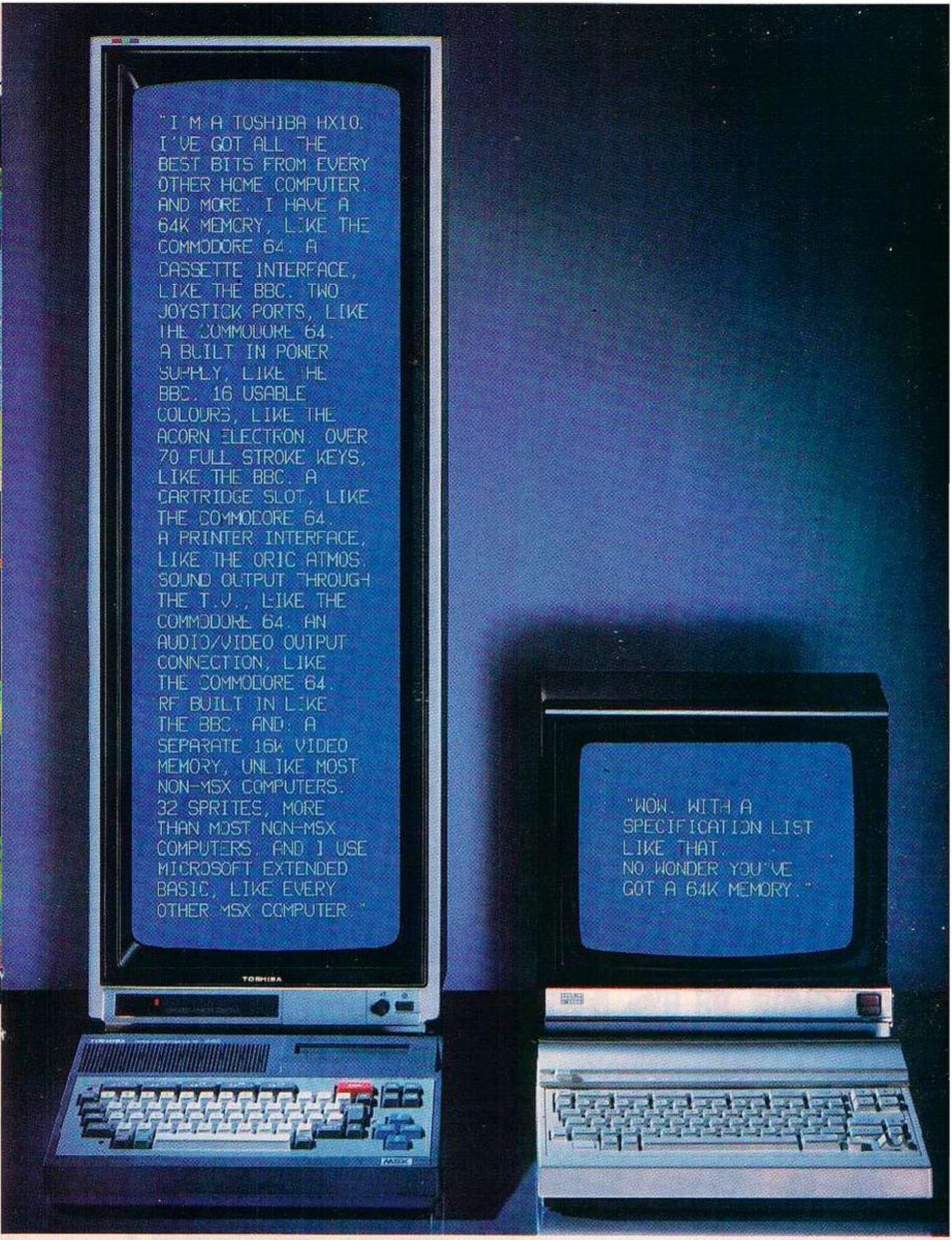
```
10 POKE 53280,0:POKE 53281,0:PRINT"[clr]"
20 PRINT"[graphics]"
30 PRINT"[graphics]"
40 PRINT"[graphics]"
50 PRINT"[graphics]"
60 PRINT"[graphics]"
70 PRINT"[graphics]"
80 PRINT"[graphics]."
90 PRINT"[graphics]PROGRAMMED BY VAHID AZODI"
100 PRINT"[graphics]              FOR"
110 PRINT"[graphics]YOUR COMPUTER (C)1984"
120 PRINT"[graphics]PLEASE WAIT WHILE LOADING DATA"
990 LOC=32768
1000 READD$:IFD$="@@@"THEN 1500
1010 H=ASC(LEFT$(D$,1))-48
1020 IFH>9THEN H=H-7
1030 H1=ASC(RIGHT$(D$,1))-48
1040 IFH1>9 THENH1=H1-7
1050 POKELOC,H*16+H1:LOC=LOC+1:GOTO 1000
1500 FORT=0TO 6349:POKE12288+T,PEEK(32768+T):NEXT T
1510 PRINT"[clr]            PRESS FIRE TO START"
1540 SYS 4096*3+3*256+16*4+2
2000 DATA00,0E,00,14,00,30,55,00
2001 DATA00,3E,00,28,E3,30,AA,22
2002 DATA00,7C,BE,81,C7,55,00,AA
2003 DATA14,01,7D,00,00,4A,00,C0
2004 DATA28,00,00,00,00,30,00,C0
2005 DATA00,00,00,00,00,30,00,C0
2006 DATA00,00,00,00,00,30,00,C0
2007 DATA00,00,00,00,00,30,00,C0
2008 DATA00,00,00,00,00,00,14,C0
2009 DATA28,55,00,AA,3E,00,7C,E3
2010 DATA81,C7,63,00,C0,BE,01,7D
2011 DATA55,00,AA,14,00,28,00,00
2012 DATA00,00,00,00,00,00,00,00
2013 DATA00,00,00,00,00,00,00,00
2014 DATA00,00,00,00,00,00,00,00
2015 DATA00,00,00,00,00,00,00,ED
2016 DATA00,00,00,00,00,28,00,C0
2017 DATAAA,0A,00,7C,2A,81,C7,3F
2018 DATA00,C4,71,C1,7D,31,00,AA
2019 DATA5F,40,28,2A,80,00,0F,00
2020 DATA00,00,00,00,00,00,0E,00
2021 DATA00,00,30,00,00,00,0E,00
2022 DATA00,00,30,00,00,00,0E,00
2023 DATA00,00,30,00,00,00,0E,80
2024 DATA00,00,30,00,30,00,FC,80
2025 DATA00,54,31,40,55,55,5E,05
2026 DATA55,14,55,55,05,A2,22,AF
2027 DATA5F,FF,FF,F7,FF,FC,0F,FF
2028 DATAC0,00,00,00,00,28,00,00
2029 DATA00,00,00,00,00,00,00,00
2030 DATA00,00,30,00,00,00,00,00
2031 DATA00,00,30,00,00,00,00,00
2032 DATA00,00,30,00,00,00,00,00
2033 DATA00,00,00,00,00,00,00,00
2034 DATA00,00,00,FF,C0,03,FF,00
2035 DATA00,00,00,00,C0,03,00,00
2036 DATA00,00,00,00,C0,03,00,00
2037 DATA00,00,00,00,F0,03,00,00
2038 DATA00,00,00,00,00,00,30,00
2039 DATA00,00,00,00,00,00,30,12
2040 DATA00,C0,00,00,C0,00,30,C0
2041 DATA00,00,C0,00,00,C0,30,00
2042 DATAC0,00,00,C0,00,00,30,00
2043 DATA00,00,00,00,00,00,30,00
2044 DATA00,00,00,00,00,00,30,00
2045 DATA00,00,00,00,00,00,30,00
2046 DATA00,00,00,00,00,00,00,00
2047 DATA00,00,00,00,00,00,00,00
2048 DATA00,00,00,00,00,00,00,00
2049 DATA00,00,00,00,00,80,00,01
2050 DATA42,00,00,24,00,00,18,00
2051 DATA00,3C,00,00,7E,00,03,FF
2052 DATAC0,1F,FF,F0,7E,00,6E,7E
2053 DATAIB,6E,1F,FF,F8,03,FF,C0
2054 DATA00,7F,00,00,63,00,00,C1
2055 DATA00,01,80,C0,07,00,70,10
2056 DATA00,FF,00,FF,00,FF,00,FF
2057 DATA00,FF,00,FF,00,FF,00,00
2058 DATA00,FF,00,FF,00,FF,00,FF
2059 DATA00,FF,00,FF,00,FF,00,FF
2060 DATA00,FF,00,FF,00,FF,00,FF
2061 DATA00,FF,00,FF,00,FF,FE,FF
2062 DATA00,FF,00,FF,FF,FF,00,FF
2063 DATA00,FF,00,FF,24,04,64,24
2064 DATA00,00,00,00,00,00,00,00
2065 DATA00,00,00,00,00,00,00,00
2066 DATA00,00,02,42,40,01,00,00
2067 DATA04,0D,20,01,24,00,03,54
2068 DATA00,01,12,00,04,AD,20,81
2069 DATA00,00,02,42,40,00,00,00
2070 DATA00,00,00,30,00,00,00,00
2071 DATA00,00,00,30,00,00,00,00
2072 DATA00,00,00,31,00,40,00,00
2073 DATA00,10,00,30,00,00,10,00
```

(continued on next page,

(continued from previous page)

```
2074 DATA00,00,40,00,02,10,30,08
2075 DATA00,00,00,00,00,00,30,00
2076 DATA0C,00,00,00,00,00,30,.0
2077 DATA00,08,40,00,02,00,30,00
2078 DATA00,00,1E,10,00,00,30,00
2079 DATA00,01,00,40,00,00,00,00
2080 DATA00,00,00,00,00,00,30,00
2081 DATA00,70,00,00,F0,00,00,30
2082 DATA00,00,31,F0,00,31,17,C0
2083 DATA31,34,4E,31,14 DF,FD,14
2084 DATA51,FJ,94,53,01,16,51,01
2085 DATAF4,51,0E,07,D9 00,00,11
2086 DATA00,00,1F,00,00,00,00,00
2087 DATA00,00,0E,00,00,00,00,00
2088 DATA00,00,0E,00,00,00,14,00
2089 DATA00,55,0E,00,3E,00,00,E3
2090 DATA00,00,63,00,00,BE,30,00
2091 DATA55,00,0E,14,00,00,00,00
2092 DATA00,00,0E,00,00,00,30,00
2093 DATA00,00,0E,00,00,00,30,00
2094 DATA00,00,0E,00,00,00,00,00
2095 DATA00,00,A0,00,00,00,00,ED
2096 DATA00,00,0E,0E,00,00,30,00
2097 DATA28,00,00,AA,00,00,7C,00
2098 DATA00,F7,A0,AA,C6,00,30,7D
2099 DATA00,00,AA,00,00,28,30,00
2100 DATA00,00,0E,00,00,00,30,00
2101 DATA00,00,0E,00,00,00,30,00
2102 DATA00,00,0E,00,00,00,30,00
2103 DATA00,00,0E,00,00,00,30,00
2104 DATA32,00,AD,00 DC,29,10,C9
2105 DATA13,D0,03,4C 42,33,AD,16
2106 DATAD9,09,10,8D 16,D0,A9,93
2107 DATA29,D2,FF,A9 00,A2,18,9D
2108 [illegible]
2109 [illegible]
2110 DATA06,9D,21,01 C9 D0,FA,20
2111 DATA02,47,AD,18 D0,09,0E,8D
2112 DATA18,D0,A9,03 8D,15,D0,A9
2113 DATAC6,8D,F8,07 8D,F1,07,A9
2114 DATA00,33,7A,02 A9,00,A2,0E
2115 DATA93,05,04,C8 D0,FA,A2,5A
2116 DATA99,05,9D,FF D7,CA,D0,F6
2117 DATA02,F0,A9,07 9D,00,39,A9
2118 DATA00,8E,CA,D0 F7,A9,C0,8D
2119 DATAFF,07,FE,07 8D,F8,07,A9
2120 DATAFE,A9,FE,07 A9,01,8D,8
2121 DATA00,33,29,D0 A9,0F,8D,50
2122 DATA8A,A9,04,8D 53,03,8D,55
2123 DATA05,A9,00,8D 50,03,A9,07
2124 DATA02,22,D0,A9 08,8D,33,30
2125 DATA02,08,A9,00 9D,FF,8B,CA
2126 DATA0A,FA,A5,90 50,9E,30,A9
2127 DATA32,8D,09,D0 A9,10,8D,15
2128 DATA0D,8D,15,D0 A9,FF,8D,18
2129 DATA04,8D,14,D4 8D,0E,04,8D
2130 DATA0F,D4,A9,81 8D,12,D4,A9
2131 DATA0E,8D,1B,D4 A9,20,8D,05
2132 DATA0D,A9,15,D0 A9,20,8D,35
2133 DATA00,A9,82,8D 0A,50,A9,C1
2134 DATA03,2D,03,A9 83,8D,3E,03
2135 DATA00,01,8D,4E 03,A9,40,8D
2136 DATA3F,03,A9,00 8D,4F,03,8D
2137 DATA4D,03,8D,48,03,8D,4A,03
2138 DATA0D,45,03,8D,EC,03,A9,CD
2139 DATA8D,29,D0,A9,A0,8D,25,D0
2140 DATA09,0C,8D,26,D0,A9,02,8D
2141 DATA1C,D0,A9,07,8D,27,D0,F9
2142 DATA00,81,00,D0,8D,02,D0,F9
2143 DATAE3,81,01,D0,A9,DA,D0,C3
2144 DATA05,00,8D,1E,D0,A9,C3
2145 DATAD,F5,A9,03,8D,.5,D0
2146 DATAD,15,D0,A9,00,A2,40,9D
2147 DATA7F,3F,CA,D0,FA,A9,FE,8D
2148 DATAFE,07,8D,FF,07,A9,C0,8D
2149 DATA00,3F,8D,83,3F,8D,86,3F
2150 DATA8D,85,3F,78,A9,00,8D,EE
2151 DATADC,A9,D9,8D,14,03,A9,34
2152 DATA8D,15,03,AD,11,D0,29,7F
2153 DATA8D,11,D0,A9,D8,8D,.2,D0
2154 DATA09,01,8D,1A,D0,58,4C,0A
2155 DATA36,AC,12,D0,C0,D8,D0,03
2156 DATA4C,EE,34,08,C0,D8,D0,03
2157 DATA4C,EE,34,4C,12,35,AD,16
2158 DATAD0,25,F8,0D,3E,03,8D,16
2159 DATAD0,AE,16,D0,29,F7,8D,16
2160 DATAD0,2E,3B,35,A9,FB,8D,12
2161 DATAD0,AE,19,D0,8D,19,D0,4C
2162 DATA8C,FE,A9,00,8D,20,30,8D
2163 DATA21,D0,A9,D8,8D,12,30,AD
2164 DATA16,D0,09,05,8D,16,D0,A0
2165 DATA16,D0,29,F8,8D,16,D0,20
2166 DATA03,3E,A9,19,D0,9D,19,D0
2167 DATA4C,31,EA,AD,7A,03,F0,01
2168 DATA00,AE,2D,03,D0,1E,AD,1C
2169 DATAD0,29,F7,8D,16,D0,AD,3E
2170 DATA03,C9,00,D0,05,A9,01,8D
2171 DATA43,03,AD,3E,03,8D,16,D0
2172 DATA85,16,D0,A9,01,9D,20
2173 DATA00,CF,3E,03,AD,02,D0,C9
2174 DATA25,D0,0B,60,CE,00,D0,CE
2175 DATA02,DE,60,AD,51,03,C9,01
2176 DATA0D,F2,60,AD,3E,03,C9,0A
2177 DATAF0,01,60,A0,00,A2,01,8D
2178 DATA70,07,99,70,07,8D,98,07
2179 DATA99,98,07,8D,C0,07,99,C0
2180 DATA07,8D,48,07,99,48,07,8D
2181 DATA70,D8,99,70,D8,8D,98,D8
2182 DATA99,98,D8,8D,C0,D8,99,C0
2183 DATAD8,8D,48,D8,99,48,D8,E8
2184 DATAC8,C0,27,D0,45,A9,07,8D
2185 DATAD,6F,07,E9,00,41,8D,97
2186 DATA07,E9,00,42,8D,BF,07,E9
2187 DATA07,E9,00,42,8D,BF,07,E9
2188 DATA43,8D,E7,07,49,0E,8D
2189 DATAF,D5,A9,0E,8D,37,D0,A9
2190 DATA07,8D,8F,D8,A9,3C,8D,E7
2191 DATAD3,C0,63,D0,09,A9,00,8D
2192 DATA56,03,EE,E0,03,50,EE,56
2193 DATA03,60,4C,9F,35,A0,4E,03
2194 DATAC9,01,30,03,4C,59,36,A0
2195 DATA4F,03,C9,FE,D0,1D,A1,4D
2196 DATA03,C9,02,30,08,A9,00,8D
2197 DATA4D,03,4C,3B,36,EE,41,03
2198 DATA40,33,49,C0,8D,F8,07
2199 DATA4C,59,36,AD,4F,03,C5,03
2200 DATAD0,17,AD,03,D0,C9,DF,D0
2201 DATA03,A9,2B,8D,03,D0,4C,59
2202 DATA36,A9,20,8D,03,D0,4C,59
2203 DATA36,AD,4C,03,C9,64,D0,06
2204 DATAA9,00,EE,4F,03,60,EE,4C
2205 DATA03,60,20,0D,36,A9,D0,3C
2206 DATA29,0F,C9,0E,D0,09,A9,09
2207 DATA8D,48,03,20,F3,26,C9,06
2208 DATAD0,0D,A9,01,8D,49,03,20
2209 [illegible]
2210 DATA07,D0,03,20,39,37,C9,08
2211 DATAD0,03,20,6E,37,49,0E,DC
2212 [illegible]
2213 [illegible]
2214 [illegible]
2215 [illegible]
2216 DATA48,30,37,20,8D,3B
2217 [illegible]
2218 [illegible]
2219 [illegible]
2220 [illegible]
2221 DATAFF,C9,0E,D0,03,20,F3,36
2222 DATA4C,02,44,A9,01,8D,4B,03
2223 DATAA9,01,8D,49,03,60,AD,55
2224 DATA03,F0,04,CE,55,03,60,A9
2225 DATA00,8D,55,03,AD,44,03,C9
2226 DATA00,D0,01,60,AD,03,D0,C9
2227 DATAC3,D0,05,A9,01,8D,4A,03
2228 DATAAD,03,30,C9,DC,D0,19,A9
2229 DATA00,8D,49,03,8D,4A,03,A9
2230 DATA48,03,8D,51,03,A9,E3,8D
2231 DATA01,D0,A9,00,8D,48,03,60
2232 DATA00,4A,03,C9,01,D0,09,EE
2233 DATA03,D0,EE,01,D0,4C,59,37
2234 DATAE,03,30,CE,01,D0,4C,59
2235 DATA37,AD,48,03,C9,01,D0,0D
2236 DATA02,30,C9,FF,F0,06,EE
2237 DATA00,D0,EE,02,D0,60,AD,54
2238 DATA03,F0,04,CE,54,03,60,A9
2239 DATA19,8D,54,03,AD,F8,07,C9
2240 DATAC2,90,05,A9,C0,8D,F8,07
2241 DATAEE,F8,07,FD,02,D0,C9,28
2242 DATA30,05,CE,00,D0,CE,02,D0
2243 DATA50,AD,53,03,F0,04,CE,53
2244 DATA03,60,A9,0A,8D,53,03,AD
2245 DATAF8,07,C9,C2,99,05,A9,C0
2246 DATA0D,F0,07,EE,F8,07,AD,02
2247 DATAD0,C9,FF,F0,05,EE,00,D0
2248 DATAEE,02,30,60,AD,52,03,F0
2249 DATA01,60,AD,02,D3,8D,04,D0
2250 DATA00,06,D0,FD,D0,D0,00,05
2251 DATAD0,8D,07,D0,A9,01,8D,15
2252 DATA03,AD,5,10,09,0C,8D,15
2253 DATAD0,A9,0D,13,D0,60,20
2254 DATA23,3F,31,60,03,20,25,7B
2255 DATA42,50,4C,20,4E,4E,37,00
2256 DATA00,3C,24,24,24,24,24,3C
2257 DATA00,18,08,E8,08,08,08,1C
2258 DATA00,3C,04,04,3C,20,20,3C
2259 DATA00,3C,04,04,1C,04,04,3C
2260 DATA00,04,0C,14,24,3E,04,04
2261 DATA00,3C,20,20,3C,04,04,3C
2262 DATA00,3C,20,20,3C,24,24,3C
2263 DATA00,3C,04,04,0E,04,04,04
2264 DATA00,3C,24,24,3C,24,24,3C
2265 DATA00,3C,24,24,3C,04,04,04
2266 DATA69,03,A9,00,D3,8D,0C,D0
2267 DATA0D,30,8D,0E,D0,AD,15
2268 DATAD0,09,40,8D,15,D0,A9,FE
2269 DATA5D,FF,07,8D,03,C0,AD
2270 DATA5F,03,F0,E4,CE,5F,03,60
2271 DATA02,8D,5F,03,A9,09,D0
2272 DATAC9,78,F0,E4,EE,09,D0,60
2273 DATA09,01,8D,5E,03,C0,AD,09
2274 DATA00,F0,04,CE,09,D0,60,A9
2275 DATA00,8D,5E,03,60,AD,68,03
2276 DATAF0,03,4C,E4,3C,AD,64,03
2277 DATAF0,03,4C,E4,03,60,A9,05
2278 DATA80,64,03,FD,6E,03,C9,01
2279 DATA10,EE,CE,D0,AD,0D,D0
2280 DATAC9,46,30,05,A9,01,9D,61
2281 DATA03,60,AD,65,03,F0,06,CE
2282 DATA65,03,4C,2A,3C,A9,4B,8D
2283 DATA65,03,AD,1B,D1,C9,C0,30
2284 DATA08,A9,03,8D,62,03,4C,2A
2285 DATA3C,C9,C8,10,0,C9,64,30
2286 DATA08,A9,02,8D,62,03,4C,2A
2287 DATA3C,C9,00,30,00,C9,64,10
2288 DATA08,A9,01,8D,62,03,4C,2A
2289 DATA3C,60,AD,62,03,C0,5E,03
2290 DATA00,03,4C,F5,3E,8E,62,03
2291 DATA9,01,8D,F3,4,3C,AE,2F
2292 DATA02,D0,03,4C,4E,3C,C9,03
2293 DATA00,03,4C,3E,3C,60,AD,0A
2294 DATA0,C9,FA,D0,03,4C,F5,3E
2295 DATA01,44,42,24,76,30,32
2296 DATAC0,E0,F0,F0,F3,F8,F8,F8
2297 DATA00,00,00,00,00,00,00,00
2298 DATA01,03,03,03,07,07,07,0F
2299 DATAFC,FC,FC,F8,FE,FF,FF,FF
2300 DATA00,00,00,00,03,EE,FF,FF
2301 DATA00,00,00,03,0F,FF,FF
2302 DATA0F,0F,3F,1F,FF,FF,FF,FF
2303 DATAFE,1F,7F,FF,FF,FF,FF,FF
2304 DATAFE,F8,FE,FF,FF,FF,FF,FF
2305 DATAFF,FF,FF,FF,FF,FF,FF,FF
2306 DATA00,E0,FF,FF,FF,FF,FF,FF
2307 DATA7C,FF,FF,FF,FF,FF,FF,FF
2308 DATA03,0F,FF,FF,FF,FF,FF,FF
2309 DATA00,00,00,00,03,0E,FF,FF
2310 DATA00,00,00,00,03,09,2A,A6
2311 DATA00,00,00,00,03,00,00,80
2312 DATA09,02,02,00,0E,2A,00
2313 DATA09,99,5A,6A,A6,AF,AA,00
2314 DATA00,00,6A,9A,AF,AA,00
2315 DATA00,00,42,7E,42,42,FF,FF
2316 DATA35,30,32,34,00,F0,39,32
2317 DATAEE,52,54,F6,20,30,33,00
2318 DATAFF,55,44,9E,43,44,47,0E
2319 DATA46,F2,50,F6,54,76,55,A6
2320 DATA00,32,FF,0F,3A,4E,CE,3A
2321 DATA00,E9,4C,44,41,20,23,30
2322 DATA00,20,39,44,89,53 54,41
2323 DATA20,21,30,34,30,AE,30,00
2324 DATA2F,3A,4E,89,49,4E 43,20
2325 DATA81,30,33,39,AE,30,00,20
2326 DATA3A,58,89,4A,4D,50,20,49
2327 DATA00,4E,34,62,83,54,58,32
2328 DATA20,4C,41,41,20,31,30,00
2329 DATAD,52,03,C9,00,D0,01,60
2330 DATAAD,04,D0,C9,59,D0,28,AD
2331 DATA00,D0,29,0F,C9,04,D0,1F
2332 DATAAD,15,D0,29,FB,8D,15,D0
2333 DATA09,00,83,05,D0,8D,04,D0
2334 DATAAD,15,D0,29,08,C9,08,F0
2335 DATA06,A9,00,8D,52,03,60,AD
2336 DATA04,D0,C9,FF,D0,0D,A9,00
2337 DATA8D,04,D0,A0,10,D0,09,04
2338 DATA8D,10,D0,EE,04,D0,AD,07
2339 DATA00,C9,1D,D0,0B,AD,15,D0
2340 DATA29,F7,8D,15,D0,4C,AC,3A
2341 DATACE,07,D0,60,A9,FF,8D,07
2342 DATA00,A9,00,8D,06,D0,60,AD
2343 DATA5C,03,F0,03,4C,AC,3A,AD
2344 DATA59,03,F0,04,CE,59,03,60
2345 DATA09,05,8D,59,03,AD,5C,03
2346 DATAC9,01,F0,10,EE,09,D0,AD
2347 DATA00,D0,C9,46,D0,05,A9,01
2348 DATAD,3C,03,60,AD,67,03,F0
2349 DATA06,CE,67,03,4C,24,3E,A9
2350 DATA4B,8D,67,03,AD,1B,D4,C9
2351 DATAC8,30,08,A9,03,8D,5A,03
2352 DATA4C,24,33,C9,C0,10,0C,C9
2353 DATA64,30,08,A9,02,8D,5A,03
2354 DATA4C,24,33,C0,00,30,0C,C9
2355 DATA64,10,08,A9,01,8D,5A,33
2356 DATA4C,24,33,60,AD,5A,03,CD
2357 DATA5B,03,D0,03,4C,EF,3A,3D
2358 DATA5A,03,C9,01,D0,03,4C,58
2359 DATA3B,C9,02,D0,03,4C,48,3B
2360 DATAC9,03,D0,03,4C,58,3B,50
2361 DATAC0,08,D0,C9,FA,D0,03,4C
2362 DATAEF,3A,EE,0E,D0,4C,0F,3B
2363 DATAAD,08,D0,C5,19,D0,03,4C
2364 DATAEF,3A,CE,0E,D0,4C,0F,3B
2365 DATA09,00,8D,67,03,A9,01,8D
2366 DATA69,03,AD,0E,D0,8D,0C,D0
2367 DATA09,D0,8E,0D,D0,AD,15
2368 DATA30,00,40,8E,15,D0,A9,FE
2369 DATAD,FF,07,8E,D0,00,60,AD
2370 DATA5F,03,F0,04,CE,5F,03,60
2371 DATA09,02,8D,5F,03,AD,09,D0
2372 DATAC9,7D,F0,04,EE,09,D0,50
2373 DATA09,01,8D,5E,03,60,AD,09
2374 DATAF0,04,CE,09,D0,60,A9
2375 DATA00,8D,5E,03,60,AD,68,03
2376 DATAF0,03,4C,84,3C,AD,64,03
2377 DATAF0,04,CE,64,03,60,A9,05
2378 DATA8D,64,03,AE,61,03,C9,01
2379 DATA00,10,EE,0E,D0,AD,0E,D0
2380 DATAC9,45,D0,05,A9,01,8D,61
2381 DATA03,60,AD,65,03,F0,06,CE
2382 DATA65,03,4C,2F,3C,A9,4B,8D
2383 DATA65,03,AD,1E,D4,C9,C8,30
2384 DATA08,A9,03,8D,62,03,4C,2A
2385 DATA3C,C9,C8,10,0C,C9,64,30
2386 DATA08,A9,02,8D,62,03,4C,2A
2387 DATA3C,C9,00,30,0C,C9,64,10
2388 DATA08,A9,01,8D,62,03,4C,2A
2389 DATA3C,60,AD,62,03,CD,5B,03
2390 DATA03,4C,F5,3B,8D,62,03
2391 DATAC9,01,D0,03,4C,6E,3C,C9
2392 DATA02,D0,03,4C,4E,3C,C9,03
2393 DATA03,4C,5E,3C,60,AD,0A
2394 DATAC9,FA,D0,03,4C,F5,3B
2395 DATAEE,09,D0,4C,95,3C,AD,0A
2396 DATAC9,19,D0,03,4C,F5,3B
2397 DATA04,D0,4C,95,3C,A9,00
2398 DATAD,65,03,A5,01,8D,6C,03
2399 DATAD,04,D0,8D,15,D0,8D,0B
2400 DATA30,0F,DE,AD,15,D0,39
2401 DATA00,15,D0,A9,FE,8D,FF
2402 DATA07,80,00,05,60,AD,66,33
2403 DATA04,CE,66,03,60,A9,32
2404 DATA8D,65,03,AE,0B,D0,C9,78
2405 DATA04,EE,0E,D0,60,A9,21
2406 DATAD,63,03,6E,AD,0B,D0,0
2407 DATA04,CE,0B,DC,60,A9,00,3D
2408 DATA68,03,60,AE,69,03,C9,30
2409 DATA01,C0,AE,6A,03,F0,04
2410 DATAE,64,03,6E,A9,03,8D,6A
2411 DATA03,A0,0D,DC,C9,E5,D0,16
2412 DATAD,15,D0,25,FF,8D,15,D0
2413 DATA00,00,AD,03,00,00,3D
2414 DATAC,30,8D,0E,D0,60,EE,30
2415 DATAD,60,AD,6C,03,C9,00,00
2416 DATA01,50,AD,6E,03,F0,04,3E
2417 DATAD,03,60,A9,03,8D,6D,33
2418 DATAD,0F,D0,C9,E5,D0,16,4D
2419 DATA15,D0,29,7F,8D,15,D0,49
2420 DATA00,8D,60,03,A9,00,8D,3F
2421 DATA00,A0,0F,A0,6A,FF,A0,00
2422 DATA60,AD,0E,DE,ED,02,D0,39
2423 DATA18,10,04,C9,00,10,03,1C
2424 DATA56,3D,A0,0F,D0,ED,03,00
2425 DATAC9,15,10,04,C9,00,10,33
2426 DATAC,56,30,4C,C1,3D,A0,3C
2427 DATA00,ED,02,D0,C9,18,10,04
2428 DATAC9,03,10,03,4C,7B,3D,AD
2429 DATAD,D9,ED,03,D0,C9,15,10
2430 DATA04,C9,00,10,03,4C,7B,3D
2431 DATA4C,C1,3D,AE,06,D0,ED,00
2432 DATAD0,C9,18,10,04,C9,00,10
2433 DATA03,4C,A0,3E,AD,07,D0,ED
2434 DATA09,D9,C9,15,10,04,C9,00
2435 DATA10,03,4C,A0,3D,4C,FB,3D
2436 DATAAD,06,D0,ED,0B,D0,C9,18
2437 DATA10,04,C9,00,10,01,60,AD
2438 DATA07,D0,ED,0B,D0,C9,15,13
2439 DATA04,C9,00,10,01,60,4C,21
2440 DATA3E,A9,00,8D,0F,D0,8D,00
2441 DATAD0,8D,0C,D0,8D,0E,D0,A9
2442 DATA01,8D,EC,03,8D,7B,03,8D
2443 DATA7A,03,A9,00,8D,10,D0,A9
2444 DATAC1,8D,F9,07,A9,CC,8D,FA
2445 DATA07,AD,00,D0,8D,04,D0,AD
2446 DATA01,D0,8D,05,D0,A9,67,8D
2447 DATA15,D0,60,A9,01,8D,72,03
2448 DATAAE,5F,A3,20,8D,4A,30,3C
2449 DATA47,A9,FF,8D,07,D0,F9,03
2450 DATA0E,06,D0,A9,FE,8D,FE,07
2451 DATAAE,76,03,69,05,8D,76,03
2452 DATA6C,A9,01,8D,71,03,A9,6A
2453 DATA03,20,8D,48,20,3C,47,A9
2454 DATAFF,8D,07,D0,A9,00,8D,06
2455 DATA0C,A9,FE,8D,FF,07,AD,76
2456 DATA03,69,05,8D,76,03,60,A9
2457 DATA7E,03,D0,01,60,AD,A9,04
2458 DATAC5,09,D0,0B,A9,00,8D,09
2459 DATA04,EE,08,4C,83,3E,AD
2460 DATA0E,04,C9,09,D0,0E,A9,00
2461 DATA8E,08,04,EE,0,4C,32
2462 DATA3E,AD,07,04,C9,09,D0,08
2463 DATA09,00,8D,07,04,EE,06,04
2464 DATAEE,09,04,CE,76,03,60,AD
2465 DATA0E,09,E9,10,8D,6F,03,AD
2466 DATA03,D0,E9,2A,8D,6E,03,AD
2467 DATA6E,03,4A,4A,4A,8D,6E,03
2468 DATA6F,03,4A,4A,4A,8D,6F
2469 DATA03,A9,00,A0,AE,6E,03,18
2470 DATA65,28,90,02,C8,.8,CA,D0
2471 DATAF7,8D,34,03,8C,35,03,18
2472 DATA34,03,6D,6F,03,8D,34
2473 DATA0C,AD,35,03,22,00,8D,35
2474 DATA03,A9,00,85,02,A9,04,85
2475 DATA03,18,A5,02,6D,34,03,85
2476 DATA0C,A5,03,6D,35,03,85,03
2477 DATA00,81,02,D0,75,03,C0
2478 DATA81,02,8D,77,33,60,AD,77
2479 DATA03,C9,20,D0,08,AD,75,03
2480 DATAC9,20,D0,01,60,4C,C1,33
2481 DATA41,21,20,4C,44,41,20,57
2482 DATA4E,41,54,54,D0,20,3F,8A
2483 DATA98,43,4D,50,20,23,31,00
2484 DATA21,3F,DA,90,42,4E 45,20
2485 DATA45,31,00,39,3F,FC,90,4A
2486 DATA4I,50,20,42,55,47,45,58
2487 DATA0E,4A,3F,ED,90,49,31,20
2488 DATA4F,53,52,20,46,49,52,48
2489 DATA45,00,59,3F,EE,90,4A,53
2490 DATA52,20,46,49,52,48,49,54
2491 DATA00,67,3F,F1,90,4A,53,52
2492 DATA20,53,4F,55,4E,44,00,74
2493 DATA3F,F2,90,4A,53,52,20,48
2494 DATA4F,4C,44,00,82,3F,F3,90
2495 DATA4A,53,52,20,53,54,41,52
2496 DATA00,00,00,C0,00,00,C0,00
2497 DATA00,C0,00,00,30,00,00,00
2498 DATA00,00,00,00,30,00,00,00
2499 DATA00,00,00,00,30,00,00,00
2500 DATA00,00,00,00,30,00,00,00
2501 DATA00,00,00,00,30,00,00,00
2502 DATA00,00,00,00,00,00,00,00
2503 DATA00,00,00,00,30,00,00,00
2504 DATA43,4D,50,20,23,31,00,D3
2505 DATA3F,5A,91,42,4E,45,20,43
2506 DATA41,21,00,DF,3F,5F,91,4A
2507 DATA4D,50,20,55,50,00,EE
2508 DATA3F,64,91,43,41,31,20,43
2509 DATA4D,50,20,23,32,00,FA,3F
2510 DATA69,91,42,4E,45,20,43,41
2511 DATA32,00,08,40,5E,91,4A,43
2512 DATA20,20,20,20,20,20,20,20
2513 DATA20,29,36,37,20,20,20,20
2514 DATA20,20,20,20,20,20,20,20
2515 DATA20,20,20,20,20,20,20,20
2516 DATA20,20,20,20,20,20,20,20
2517 DATA20,20,20,20,29,36,37,20
2518 DATA20,29,36,37,20,20,20,20
2519 DATA20,20,20,20,20,20,20,20
2520 DATA20,20,20,20,20,20,20,20
2521 DATA20,20,20,20,20,20,20,20
2522 DATA20,20,20,20,20,20,20,20
2523 DATA20,20,20,20,20,20,20,20
2524 DATA20,20,20,20,20,20,20,20
2525 DATA20,20,20,00,F7,00,F7,00
2526 DATAFF,00,FF,00,FF,00,FF,00
2527 DATAFF,00,FF,00,FF,00,FF,00
2528 DATAF6,00,FF,00,F7,00,FF,00
2529 DATAFF,00,FF,00,FD,00,FF,00
2530 DATAFE,44,FF,00,FF,00,FF,00
2531 DATAFF,00,74,6F,00,FF,00,FF
2532 DATA00,FF,00,FF,04,FF,00,FF
2533 DATA00,D0,00,FF,F2,FF,00,FE
2534 DATA00,FF,00,FF,00,FF,00,00
2535 DATA00,FF,00,FF,00,FF,00,FF
2536 DATA00,FF,00,FF,00,FF,00,FF
2537 DATA00,FF,00,FF,00,FF,00,FF
2538 DATA00,FF,00,FF,00,FF,00,FF
2539 DATA00,FF,00,FF,00,FF,00,FF
2540 DATA00,FF,00,FF,00,FF,00,FF
2541 DATA00,FF,00,FF,00,FF,00,FF
2542 DATA00,FF,00,00,00,FF,00,FF
2543 DATA00,FF,00,FF,91,67,FF,40
2544 DATA20,20,20,20,20,20,20,20
2545 DATA20,38,39,3A,20,20,20,20
2546 DATA26,26,20,20,20,20,20,20
2547 DATA20,20,20,20,26,26,26,26
2548 DATA20,20,20,20,20,20,20,20
2549 DATA20,20,20,38,39,3A,20,20
2550 DATA20,38,39,3A,3B,20,20,20
2551 DATA20,26,26,20,20,20,20,20
2552 DATA20,20,26,26,20,20,20,20
2553 DATA20,20,20,20,26,26,26,20
2554 DATA20,20,20,20,20,20,38,20
2555 DATA20,20,20,20,20,3B,20,20
2556 DATA20,20,20,20,3B,20,20,20
```

(continued on page 71)



You'd expect one of the best-selling home computers in Japan to have a specification list as big as its memory.

But the Toshiba HX10 doesn't just limit itself to that.

It was developed along with other Japanese home computers to operate on one language: MSX. You can swap programs, games, cassettes, even peripherals like disk drives, printers, and joysticks: they're all compatible with every other MSX computer.

All of which makes MSX the system of the future.

So if you want a computer that won't be obsolete in a few years, buy an MSX. If you want one of the best-selling MSX computers in Japan, buy a Toshiba HX10.

TOSHIBA MSX

FOR MORE INFORMATION ON THE TOSHIBA HX10 CONTACT TOSHIBA (UK) LTD., TOSHIBA HOUSE, FRIMLEY ROAD, FRIMLEY, SURREY GU16 5JJ. TEL: (0276) 681691.

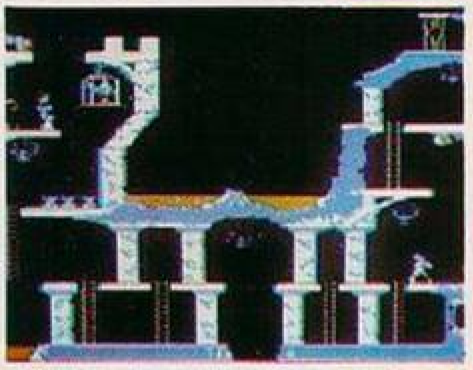
Are you brave enough to enter the savage world of mighty Conan?

You've experienced his barbaric world in movies, novels and comics. Now Conan is ready to spring to life in your home.

So flex your muscles and prepare to do battle.

Your mission is to slay Conan's wicked rival and bring home a bounty of gems. Blocking your way are fire-breathing dragons, poisonous scorpions, vicious bats and other deadly adversaries.

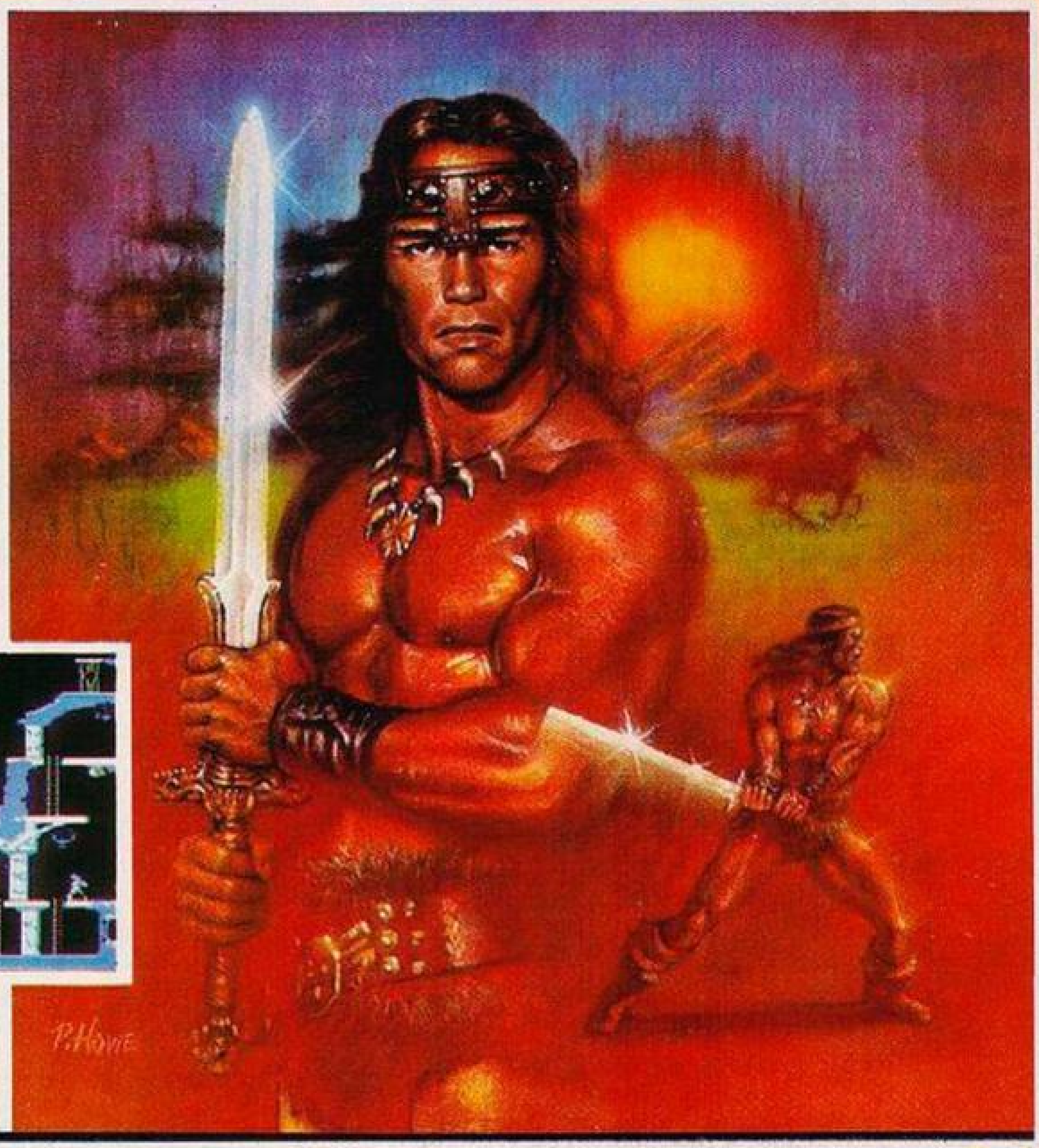
If that wasn't enough, you also have to fight your way through dark caves and dangerous dungeons, while looking out for mysterious creatures waiting their moment to attack!



ATARI

64

Commodore 64/ Atari Disk	£14.95
Commodore 64/ Atari Cassette	£9.95

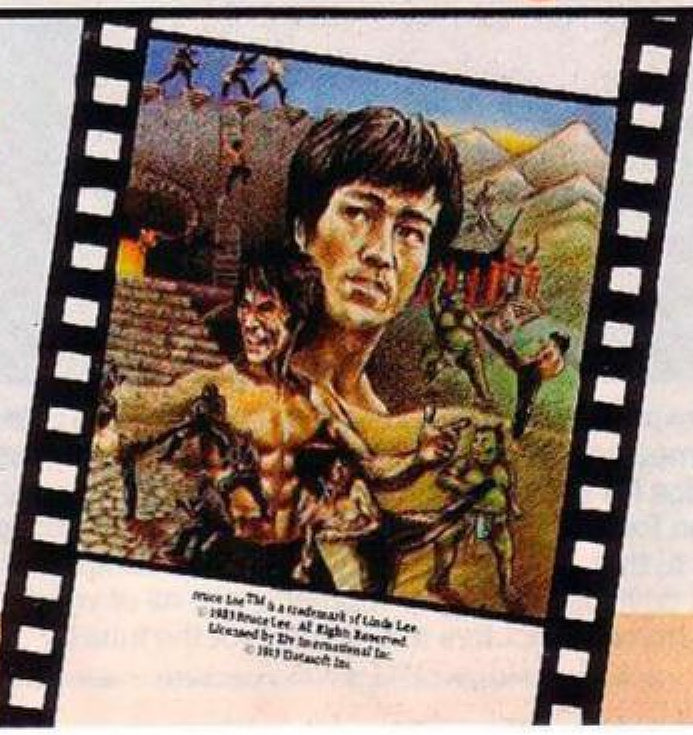


FAMOUS FACES™ from Datasoft®

THE LEGENDARY BRUCE LEE

• Twenty Secret Chambers • Dazzling Graphics
• Unique Multiple Player Options

Spectrum 48K	£7.95
Commodore 64 Cassette	£9.95
Commodore 64 Disk	£14.95
Atari Disk/Cassette	£14.95



U.S. GOLD — A1 American Software

U.S. Gold Limited, Unit 10,
Parkway Industrial Centre, Heneage Street,
Birmingham B7 4LY. Tel: 021-359 3020.

(continued from page 68)

```
2557 DATA20,20,20,00,FF,00,FF,03
2558 DATAFF,00,FF,00,FF,00,FF,03
2559 DATAFF,00,FF,00,FF,00,FF,03
2560 DATAF6,00,FF,00,FF,00,C0,00
2561 DATAFF,00,FF,00,FD,00,FF,00
2562 DATAFE,20,FF,00,FF,00,9E,00
2563 DATAFF,00,74,FF,00,FF,00,FF
2564 DATA00,FF,00,FF,04,FF,00,FF
2565 DATA00,DA,00,FF,F2,FF,00,FE
2566 DATA00,FF,00,FF,00,FF,00,00
2567 DATA00,FF,00,FE,20,00,00,FF
2568 DATA00,FF,00,FF,00,FF,00,FF
2569 DATA00,FF,00,FF,00,FF,00,FF
2570 DATA00,FF,00,FF,00,FF,00,FF
2571 DATA00,FF,00,FF,00,FF,00,FF
2572 DATA00,FF,00,FF,00,FF,00,FF
2573 DATA00,FF,00,FF,00,FF,00,FF
2574 DATA00,FF,00,00,00,FF,00,FF
2575 DATA00,FF,00,FF,01,67,FF,00
2576 DATA32,33,34,32,33,34,32,33
2577 DATA34,31,31,31,32,33,2F,28
2578 DATA29,29,2A,30,33,34,32,33
2579 DATA34,32,33,2F,28,29,29,29
2580 DATA2A,30,33,34,32,33,34,31
2581 DATA32,33,34,31,31,31,32,33
2582 DATA34,31,31,31,31,32,33,2F
2583 DATA28,29,29,29,30,34,32,33
2584 DATA2A,28,29,29,29,2A,30,34
2585 DATA32,33,2F,28,29,29,29,34
2586 DATA30,31,34,32,33,34,31,32
2587 DATA33,34,32,33,34,31,32,33
2588 DATA34,32,33,34,31,32,33,34
2589 DATA32,33,34,F7,00,FF,00,FF
2590 DATA00,FF,00,FF,00,FF,00,FF
2591 DATA00,FF,00,FF,00,FF,00,F6
2592 DATA00,FF,00,F7,00,20,00,FF
2593 DATA00,FF,00,FD,00,BF,00,FE
2594 DATA24,FF,00,FF,00,2D,00,FF
2595 DATA00,74,00,6F,00,FF,00,FF
2596 DATA00,FF,00,FF,04,FF,00,FF
2597 DATA00,DF,00,FF,F2,FF,00,FE
2598 DATA00,FF,00,FF,00,FF,00,C0
2599 DATA00,FF,00,F6,20,30,00,F7
2600 DATA00,FF,00,FF,00,FF,00,FF
2601 DATA00,FF,00,FF,00,FF,00,FF
2602 DATA00,FF,00,FF,00,FF,00,FF
2603 DATA00,FF,00,FF,00,FF,00,FF
2604 DATA00,FF,00,FF,00,FF,00,FF
2605 DATA00,FF,00,FF,00,FF,00,FF
2606 DATA00,FF,AA,AA,AA,FF,AA,FF
2607 DATA00,FF,00,FF,01,57,FF,C0
2608 DATA31,31,31,31,31,31,31,31
2609 DATA31,31,31,31,31,31,31,2B
2610 DATA2C,2D,2E,31,31,31,31,31
2611 DATA31,31,31,31,2B,2C,35,2D
2612 DATA2E,31,31,31,31,31,31,31
2613 DATA31,31,31,31,31,31,31,31
2614 DATA31,31,31,31,31,31,31,31
2615 DATA2B,2C,2D,2E,31,31,31,31
2616 DATA31,2B,2C,35,2D,2E,31,31
2617 DATA31,31,31,2B,2C,30,30,2E
2618 DATA31,31,31,31,31,31,31,31
2619 DATA31,31,31,31,31,31,31,31
2620 DATA31,31,31,31,31,31,31,31
2621 DATA31,31,31,FD,6D,FD,29,FD
2622 DATA00,FD,00,FD,00,FD,00,FD
2623 DATA00,FD,20,FD,64,FF,00,60
2624 DATA00,FF,00,80,ED,03,00,FE
2625 DATA00,FF,00,FD,00,9F,00,FE
2626 DATA20,F3,00,FB,E9,01,60,92
2627 DATA00,F4,00,EC,28,FB,00,40
2628 DATA04,FF,00,FF,04,BF,00,FF
2629 DATA00,DA,00,FF,F8,24,00,00
2630 DATA00,FF,00,FF,E9,FB,00,00
2631 DATA00,AD,A8,4C,F9,E9,00,69
2632 DATA0C,FF,00,FE,00,FE,40,EE
2633 DATAD4,EF,FF,FF,40,77,04,6F
2634 DATA00,FF,00,FF,00,FB,00,F3
2635 DATA09,FF,00,FF,E9,E9,00,A1
2636 DATA00,ED,20,ED,60,A9,00,E1
2637 DATA00,DD,00,FD,6D,E5,E6,99
2638 DATAFF,FB,0B,36,08,FA,0C,E6
2639 DATA68,AC,28,28,68,60,63,28
2640 DATAFF,E0,AD,78,03,C9,01,D0
2641 DATA03,4C,1E,44,20,57,45,20
2642 DATADE,45,20,08,48,20,93,48
2643 DATA20,3E,48,4C,4A,36,4C,98
2644 DATA48,AD,78,03,C9,01,D0,03
2645 DATA4C,4F,44,C9,02,D0,03,4C
2646 DATA67,44,C9,03,D0,03,4C,7F
2647 DATA44,C9,04,D0,03,4C,97,44
2648 DATAC9,05,D0,03,4C,AF,44,C9
2649 DATA06,D0,03,4C,C7,44,60,AD
2650 DATA01,D0,C9,4E,B0,09,A9,02
2651 DATA8D,78,03,4C,1E,44,CE,01
2652 DATAD0,CE,05,D0,4C,1A,44,AD
2653 DATA01,D0,C9,EB,90,09,A9,03
2654 DATA8D,79,03,4C,1E,44,CE,01
2655 DATAD0,EE,05,D0,4C,1A,44,AD
2656 DATA01,D0,C9,96,B0,09,A9,04
2657 DATA8D,78,03,4C,1E,44,CE,01
2658 DATAD0,CE,05,D0,4C,1A,44,AD
2659 DATA01,D0,C9,EB,90,09,A9,05
2660 DATA8D,78,03,4C,1E,44,EE,01
2661 DATAD0,EE,05,D0,4C,1A,44,AD
2662 DATA01,D0,C9,C8,B0,09,A9,06
2663 DATA8D,78,03,4C,1E,44,CE,01
2664 DATAD0,CE,05,D0,4C,1A,44,AD
2665 DATA01,D0,C9,EB,90,E3,4C,1C
2666 DATA45,EE,01,D0,EE,F5,D0,4C
2667 DATAD0,44,AD,79,03,10,2C,AD
2668 DATA04,D0,C9,FF,B0,FD,A9,00
2669 DATA8D,04,D0,A9,04,0D,14,D0
2670 DATA8D,10,D0,EE,04,D0,C5,00
2671 DATAD0,AD,03,D0,C9,EB,D0,03
2672 DATA4C,06,45,EE,03,D0,A9,11
2673 DATA8D,79,03,CE,79,E3,A2,32
2674 DATA90,32,88,D0,FD,CA,D0,F8
2675 DATA4C,1E,44,63,4C,34,46,A9
2676 DATA33,8D,15,D0,A9,0E,8D,1A
2677 DATAD0,A9,00,8D,00,DE,8D,02
2678 DATAD0,A9,C0,8D,58,07,A9,53
2679 DATA8D,91,30,A9,DA,8D,03,D0
2680 DATAA9,C3,8D,F4,07,A9,00,8D
2681 DATA7A,03,02,FC,00,FF,07,A9
2682 DATA09,8D,56,03,4C,6F,36,AD
2683 DATA52,03,D0,01,60,A1,04,D0
2684 DATAE9,18,8D,78,03,A1,05,D0
2685 DATAE9,32,8D,73,02,A1,78,03
2686 DATA4A,4A,4A,80,7F,03,AD,7C
2687 DATA03,4A,4A,44,8D,7C,03,A9
2688 DATA00,A8,AE,7C,03,18,69,28
2689 DATA90,02,C8,13,CA,D0,F7,8D
2690 DATA36,03,8C,37,03,18,AD,36
2691 DATA03,6D,7B,03,8D,36,03,AD
2692 DATA37,03,69,03,8D,37,03,AD
2693 DATA10,30,29,01,C9,04,D0,10
2694 DATAAD,36,03,69,20,8D,36,03
2695 DATAAD,37,03,69,00,8D,37,A5
2696 DATAA9,00,85,FB,A9,04,85,FC
2697 DATAA5,FB,6D,36,03,85,FB,A5
2698 DATAFC,6D,37,03,85,FC,A0,00
2699 DATA01,FB,6D,73,03,60,AD,7D
2700 DATA03,C9,20,D0,01,60,C9,26
2701 DATAD0,01,60,C9,38,D0,01,60
2702 DATA20,8C,47,A0,00,A9,20,91
2703 DATAFB,C8,91,F3,C8,91,FB,A0
2704 DATA28,91,FB,C8,91,FB,C8,91
2705 DATAFB,A9,C0,8D,52,03,A9,00
2706 DATA8D,04,10,8D,05,D0,8D,0E
2707 DATAD0,A9,FF,8D,07,D0,A9,90
2708 DATA85,FB,F9,05,85,FC,A9,20
2709 DATA8D,7D,C3,AD,76,03,69,02
2710 DATAD0,76,C3,90,CE,15,04,A9
2711 DATA0A,0D,7E,03,A0,7E,03,F0
2712 DATA10,A2,FF,A0,FF,88,D0,FD
2713 DATACA,D0,F8,CE,7E,03,4C,3C
2714 DATA46,AD,15,04,F0,03,4C,C5
2715 DATA46,4C,4D,47,A9,11,8D,34
2716 DATA05,8D,FF,04,A9,00,8D,15
2717 DATAD0,A9,CB,8D,35,05,8D,B0
2718 DATA04,A9,17,8D,36,05,8D,B1
2719 DATA04,A9,0F,8D,37,05,8D,B2
2720 DATA04,A9,20,A9,19,8D,B4,04
2721 DATA09,21,ED,B5,04,A9,0F,8D
2722 DATA0F,04,F9,1C,8B,B7,04,A9
2723 DATA1A,8D,1F,05,A9,1C,8D,20
2724 DATA05,A9,0F,8D,21,05,A9,1D
2725 DATA8D,22,05,8D,23,05,A9,10
2726 DATA8D,25,05,A9,13,8D,26,05
2727 DATA09,1C,ED,27,05,A9,0F,8D
2728 DATA28,05,F9,18,8D,2A,05,A9
2729 DATA19,8D,2B,05,A9,1C,8D,2C
2730 DATA05,A9,0B,8D,2E,05,A9,18
2731 DATA8D,30,05,A9,0F,8D,31,05
2732 DATAA9,22,8D,32,05,AD,00,DC
2733 DATA29,10,C9,10,D0,03,4C,E5
2734 DATA16,4C,9A,47,60,A9,20,A2
2735 DATA50,9D,48,07,CA,D0,FA,4C
2736 DATA1C,45,A9,10,8D,00,04,8D
2737 DATA1C,04,8D,13,04,A9,0D,8D
2738 DATA01,04,8D,1D,04,A9,19,8D
2739 DATA02,04,8D,1E,04,A9,1C,8D
2740 DATA03,04,8D,1F,04,A9,0F,8D
2741 DATA04,04,8D,20,04,8D,12,04
2742 DATAA9,16,8D,0F,04,A9,13,8D
2743 DATA10,04,8D,1A,04,A9,21,8D
2744 DATA11,04,A9,13,8D,1A,04,A9
2745 DATA12,8D,17,04,60,AD,22,04
2746 DATAC3,06,04,30,37,F0,03,4C
2747 DATA5C,46,AD,23,04,CD,07,04
2748 DATA30,2A,F0,03,4C,5C,46,AD
2749 DATA24,04,CD,08,04,30,1D,F0
2750 DATA03,4C,5C,46,AD,25,04,CD
2751 DATA09,04,30,10,F0,03,4C,5C
2752 DATA46,AD,26,04,CD,0A,04,30
2753 DATA08,4C,5C,46,A2,06,2D,05
2754 DATA04,9D,21,04,CA,D0,F7,4C
2755 DATA5C,46,A9,00,A2,06,9D,05
2756 DATA04,CA,D0,FA,A9,20,A2,00
2757 DATA9D,AF,04,CA,D0,FA,A9,20
2758 DATAA2,A0,9D,47,07,CA,D0,FA
2759 DATA4C,77,33,60,A9,0C,8D,05
2760 DATAD4,A9,00,8D,06,D4,A9,C3
2761 DATA8D,00,D4,A9,1A,8D,01,D4
2762 DATAA9,90,8D,04,D4,A9,81,8D
2763 DATA04,D4,60,AD,EC,03,C9,00
2764 DATAD0,03,4C,21,44,A9,0D,8D
2765 DATA05,D4,A9,00,8D,06,D4,A9
2766 DATA30,8D,00,D4,A9,04,8D,01
2767 DATAD4,A9,80,8D,04,D4,A9,81
2768 DATA8D,04,D4,A9,00,8D,EC,03
2769 DATA4C,21,44,AD,EC,03,F0,01
2770 DATA60,AD,49,03,C9,00,F0,09
2771 DATAA9,00,8D,07,D4,8D,08,D4
2772 DATA60,A9,11,8D,0B,D4,AD,ED
2773 DATA03,F0,04,CE,ED,03,60,A9
2774 DATA03,8D,ED,03,AD,EB,03,C9
2775 DATA04,F0,20,AD,E9,03,8D,07
2776 DATAD4,AD,EA,03,8D,08,D4,18
2777 DATAAD,E9,03,69,1F,8D,E9,03
2778 DATAAD,EA,03,69,00,8D,EA,03
2779 DATAEE,EB,03,A9,18,8D,E9,03
2780 DATAA9,02,8D,EA,03,A9,10,8D
2781 DATA03,D4,A9,00,8D,EC,03,60
2782 DATAA9,93,8D,E8,03,A9,10,8D
2783 DATA0C,D4,A9,00,8D,EB,03,8D
2784 DATA0D,D4,A9,18,8D,E9,03,A9
2785 DATA02,8D,EA,03,60,A9,01,A2
2786 DATA00,9D,FF,D3,CA,D0,FA,60
2787 DATA4C,DB,47,A5,C5,C9,04,D0
2788 DATA14,AD,00,DC,29,0F,C9,0F
2789 DATAD0,0B,A9,01,8D,7A,03,8D
2790 DATAEC,03,4C,A1,48,A9,00,8D
2791 DATAEC,03,8D,7A,03,60,A5,C5
2792 DATAC9,05,D0,03,4C,4E,33,60
2793 DATA9C,54,00,8D,46,63,00,90
3000 DATA ***
```

MAIL ORDER PROTECTION SCHEME

If you order goods from Mail Order advertisements in this magazine and pay by post in advance of delivery, *Your Computer* will consider you for compensation if the Advertiser should become insolvent or bankrupt, provided that:

(1) You have not received the goods or had your money returned; and

(2) You write to the Publisher of of *Your Computer* summarising the situation not earlier than 28 days from the day you sent your order and not later than two months from that day.

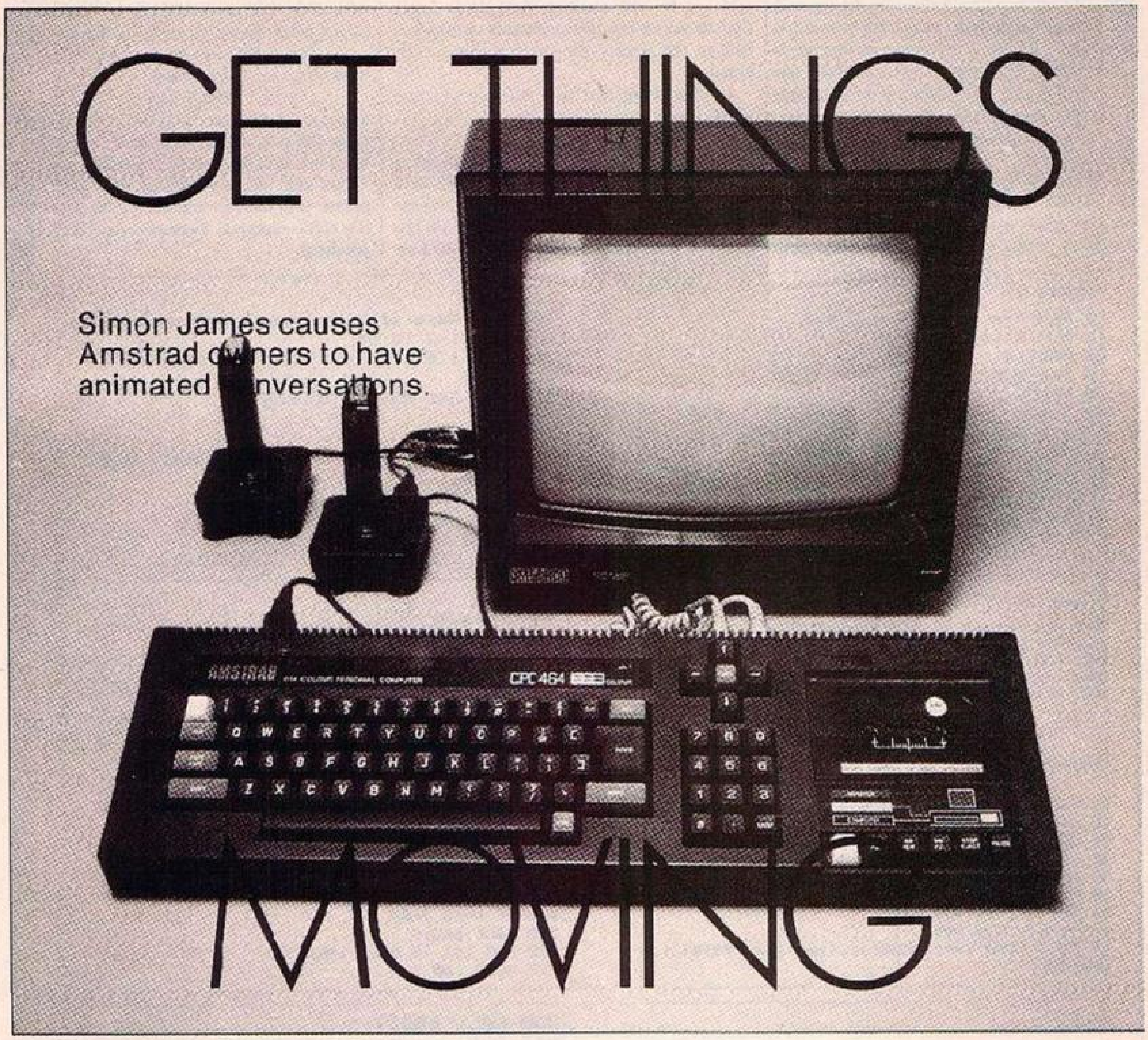
Please do not wait until the last moment to inform us. When you write, we will tell you how to make your claims and what evidence of payment is required.

We guarantee to meet claims from readers made in accordance with the above procedure as soon as possible after the Advertiser has been declared bankrupt or insolvent.

This guarantee covers only advance payment sent in direct response to an advertisement in this magazine not, for example, payment made in response to catalogues etc., received as a result of answering such advertisements. Classified advertisements are excluded.

GET THINGS MOVING

Simon James causes Amstrad owners to have animated conversations.



AN INTERESTING and very useful feature of the new Amstrad computer, is its Ink command. This enables you to redefine the colours available in any mode to those which suit you. The User Guide explains it by reference to pens and ink. For instance, in mode 0 there are 16 colours available, from a palette of 27 colours. This is like having 16 pens and 27 ink pots available and the ink in any pen can be changed. It is something like VDU 19 command on the BBC micro. As an example type in:

```
(Reset) (Press 'Ctrl' and 'Shift' and then
'Esc', holding all three down) INK 1,9
(Enter)
```

You will see that all the writing on the screen has changed colour — or shade if you have a green monitor. This is because when you switch on or Reset the computer, pen 1 is being used, and is set to colour 24, bright yellow. The above Ink command told the computer to change the ink in pen 1 to number nine, green. Try other numbers, for instance,

```
INK 1,15 (changes the ink in pen 1 to
orange)
```

until you get the hang of it.

This command can be used to produce animation — movement — on the screen. It is done by redefining all the available colours to the background colour, and making one colour at a time visible. Type in listing 1 and run it. You will see at the start, the screen being filled up with multicoloured vertical lines. Then most of them disappear, and a few start to move across the screen.

In actual fact, nothing is really moving. What happens is that lines are drawn using the 16 different pens. These pens are defined as various colours after a Reset or switch on. You can see what these colours are by reference to pages F3.2 and F3.4 in the manual. The program then changes the ink in all of these pens to black — the background colour — so the lines appear invisible. Then each pen in turn is filled with bright white, and the effect of movement is achieved.

Program 2 is the part of the program that actually changes the colours. Study carefully how it works and then type it in and save it. It can then be merged — see Ch.8 page 27 — into any programs you write which use this technique.

Program 3 shows the spectacular effects that can be produced by this useage of the Ink command. 15 circles are drawn — using Sin and Cos, see page F3.13 — using different pens, and each one illuminated in turn.

This method can also be a lot faster than other ways of animating, because all that is required is a few lines of Basic, and several objects at once can move, where other methods would have to deal with each in turn — and would therefore be slower. Program 4 is a good example of this. Pens 2 to 15 are used for the movement, pen 0 being the background colour, and pen 1 the pen used for the writing, and the boxes. If pen 1 was used in the animation sequence, the boxes would flash on and off. Note that this effect could be quite useful, but was unecessary in this program.

Another point to note is that in programs 1, 3 and 4, if you break, using (Esc) (Esc), and Run them again, the initialisation secuence

(continued on next page)

(continued from previous page)
where the multicoloured lines are drawn, will be invisible since all the pens have been filled with black ink, and are being written onto black paper. So do not assume something has gone wrong with the program if nothing happens for a few minutes. This is most noticeable in program 3 with the circles, in which the circles take a while to draw.

In programs 3 and 4 I have included a delay loop which can be altered by changing the variable 'delay' defined at the beginning of the programs. If you remove the loop altogether, you will get some idea of the speed that can be achieved by this method. And don't forget that no matter how many moving objects you had on the screen, the speed would be the same!

Another thing that was put into the programs was:-

CALL &BD19

This is a call to the machine operating system which makes the computer pause until the next frame, — i.e. until a full sweep of the screen is finished by the mechanism inside the monitor. Each frame takes about 1/50 of a second, so this does not slow down the program noticeably, but prevents some strange effects taking place. As an example of what can happen without this instruction, remove line 205 from Program 1, by typing:

205(Enter)

and run the program. You will see that sometimes there are two vertical lines close to each other crossing the screen, sometimes just one.

You can now try writing your own programs — if you feel confident enough! — using this technique, because it has enormous potential. ■

Program 1.

```
10 REM *** PROGRAM ONE ***
15 REM Initialise
20 MODE 0
30 INK 0,0
40 PAPER 0
50 col=1
55 REM Draw multicoloured lines
60 FOR x=10 TO 639 STEP 10
70 MOVE x,5
80 DRAW x,395,col
90 col=(col+1) MOD 16
110 IF col=0 THEN col=1
120 NEXT
125 REM Make all the pens black except pen 1
130 FOR i=2 TO 15
140 INK i,0
150 NEXT
155 REM Get things moving
160 x=1
170 INK x,26
180 IF x=1 THEN INK 15,0 ELSE INK x-1,0
190 x=x+1
200 IF x=16 THEN x=1
205 CALL &BD19
210 GOTO 170
```

Program 2.

```
3000 REM ROUTINE TO SWAP COLOURS
3001 REM Use for merging into your own programs
3002 FOR i=2 TO 15
3003 INK i,0
3004 NEXT
3005 x=1
3006 INK x,26
3007 IF x=1 THEN INK 15,0 ELSE INK x-1,0
3008 x=x+1
3009 IF x=16 THEN x=1
3010 CALL &BD19
3011 GOTO 3005
```

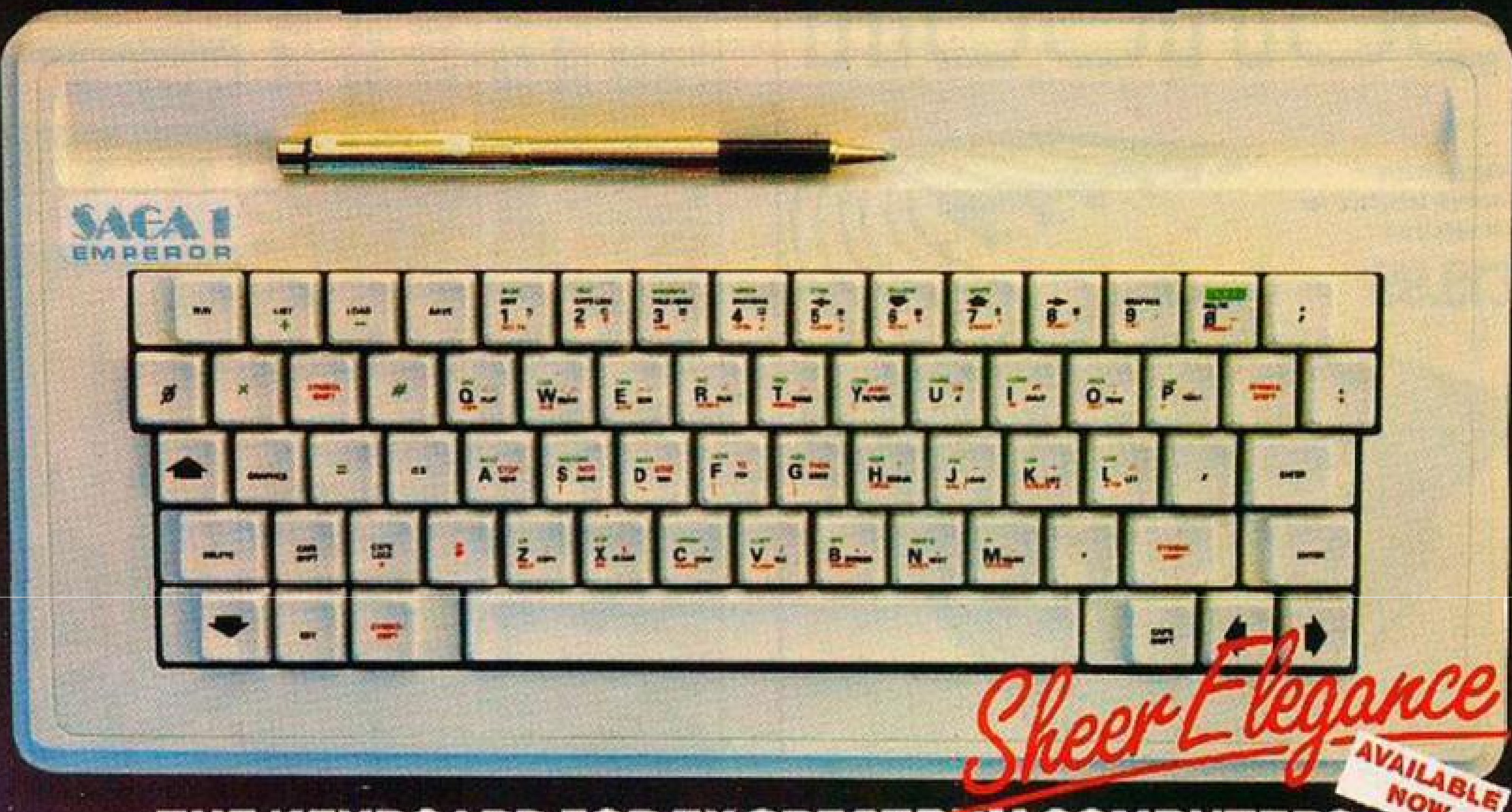
Program 3.

```
10 REM *** PROGRAM THREE ***
20 MODE 0
30 delay=20
40 INK 0,0
50 DEG
60 FOR i=1 TO 15
70 FOR j=1 TO 360 STEP 1
80 ORIGIN 320,200
90 PLOT (180-12*i)*COS(j),(180-12*i)*SIN(j),i
100 NEXT
110 NEXT
120 FOR i=2 TO 15
130 INK i,0
140 NEXT
145 REM FIRE AWAY!
150 x=1
160 INK x,26
170 IF x=1 THEN INK 15,0 ELSE INK x-1,0
180 x=x+1
190 IF x=16 THEN x=1
200 CALL &BD19
210 FOR i=1 TO delay:NEXT
220 GOTO 160
```

Program 4.

```
10 REM *** PROGRAM 4 ***
20 MODE 0
30 RESTORE
40 delay=100
50 PEN 1
60 LOCATE 8,2:PRINT "BOXES"
70 FOR i=1 TO 4
80 READ x,y
90 GOSUB 290
100 NEXT
110 DATA 100,300,100,50,500,50,500,300
120 RESTORE
130 FOR a=1 TO 4
140 READ x,y
150 GOSUB 430
160 NEXT
170 FOR i=3 TO 15
180 INK i,0
190 NEXT
200 x=2
210 INK x,26
220 IF x=2 THEN INK 15,0 ELSE INK x-1,0
230 x=x+1
240 IF x=16 THEN x=2
250 CALL &BD19
260 FOR q=1 TO delay:NEXT
270 GOTO 210
280 END
290 REM SUBROUTINE TO DRAW BOXES
300 MOVE x,y
310 DRAWR 0,-50,1
320 DRAWR 65,0,1
330 DRAWR 0,50,1
340 DEG
350 MOVE x,y
360 FOR z=1 TO 360 STEP 20
370 ORIGIN x,y
380 DRAW 5*COS(z),5*SIN(z),1
390 NEXT
400 ORIGIN 0,0
410 RETURN
420 REM SUBROUTINE TO DRAW LIDS
430 DEG
440 col=2
450 FOR z=1 TO 90 STEP 6.9
460 ORIGIN x,y
470 DRAW 60*COS(z),60*SIN(z),col
480 col=col+1
490 NEXT
500 RETURN
```

SAGA 1 EMPEROR



THE KEYBOARD FOR ZX SPECTRUM COMPUTERS

* **EASY FITTING**
* **PLEASURE TO USE**
* **LONG LASTING**

The Saga 1 Emperor, equipped with 67 keys, is a carefully designed replacement keyboard incorporating many special functions for the popular Spectrum Computer. For business or pleasure, the Emperor will make your computing time more productive and enjoyable. The SAGA 1 Emperor will enable you to use the Spectrum as a powerful programming tool easier and faster.

The style is easy:- for your benefit, the SAGA 1 Emperor has been designed to ensure that available Spectrum Peripherals will fit in the usual manner.

The assembly of the keyboard is simple — and fast. No soldering required, so that within just 5 minutes you can replace your current ZX Spectrum with the new SAGA 1 Emperor.

AND ALL THIS FOR JUST £54.95 (inc. VAT)

SAGA P.C.!
Your very own Personal Carrier, partitioned to neatly accommodate your Spectrum, Saga 1 Emperor and peripherals, Tape Recorder, Power Supply, Cables, manuals and cassettes. Of solid and attractive construction the P.C. is ideal for storing and transporting your computer accessories. The case uses a strong double stitched and bound Black Calf Vinyl with a tough thick ABS inner compartment, leather buckles and a strong handle. Only **£26.95** (inc. VAT)

DUSTCOVER
Another top quality product, this expertly produced long-lasting bound and sewn dustcover has been specifically designed for the SAGA 1 Emperor, which will keep everything looking neat and dust free. Only **£4.95** (inc. VAT).

SOUNDBOOST
Hear that keyboard click with a SAGA SOUNDBOOST
The SAGA SOUNDBOOST is a tiny electronic circuit which considerably enhances the sound volume and quality of the Spectrum sound output. Adjustable from a whisper to a roar, the SOUNDBOOST provides added realism and excitement for games players and security for programmers (Hear that Keyboard Click!). No cutting, no soldering — just connect.
Only **£9.50** (inc VAT).

FLEXICABLE
Developed to relieve your Spectrum from the pressure of life, to fit your Spectrum and your add-ons taking the load with ease. By popular demand we now have two versions of the 9 inch FLEXICABLE available to suit your needs.
Male-Female FLEXICABLE — £12.45
Female-Female FLEXICABLE — £9.50
Convertor PCB — £2.95

THE COLLECTION

The latest addition to our product range is The Collection, providing you with three money saving action packed specials containing quality products — an ideal gift.

COLLECTION 1 — SAVE £10.00!!
r.r.p. £53.85
Our special price £43.85
includes: Saga Personal Carrier £26.95
Soundboost £9.50
Dustcover £4.95
Flexicable (M-F) £12.45

COLLECTION 2 — SAVE £20.00!!
r.r.p. £100.00
Our special price £88.80
Collection 1 £53.85
Saga 1 Emperor £54.95

COLLECTION 3 — SAVE £30.00!!
r.r.p. £238.75
Our special price £208.75
Collection 2 £108.80
48K Sinclair ZX Spectrum £129.95

DISTRIBUTOR & TRADE ENQUIRIES CALL NOW ON WOKING (04862) 22922

Please write to: SAGA Systems Limited,
Dept. 2 Eve Road, Woking, Surrey
Telephone Woking (04862) 69527/22922
or Telex 859298
All prices include VAT
P&P free for Sound Boost and Flexicable.
P&P £1.25 for SAGA 1 Emperor U.K.
£4.00 for SAGA 1 Emperor Europe
£15.00 for SAGA 1 Emperor U.A.E.

Please send me
Name ______
Address ______
______
The following SAGA PRODUCTS ______
______
Total amount enclosed £ ______
Please make CHEQUES/P.O. Payable to SAGA Systems Ltd.

COMCON

Programmable Joystick Interface for the Spectrum

£19.95

Simple and fast programming. Plug the six function connectors into the required Spectrum key positions – Ready!

Two independent fire actions. Photon Blasters and Neutron Bombs at the touch of your fingertips.

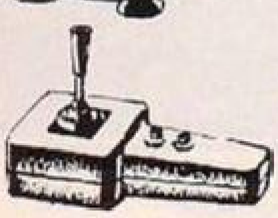
Extension port for Currah Microspeech and Combine joystick with sound and speech for ultimate arcade action.

Compatible with all Atari-type joysticks including Quickshot II (without rapid fire action).

Interface operates joystick parallel to keyboard. Joystick action compatible with any add-ons including Microdrives.

QUICKSHOT 2+2 JOYSTICK

modified to incorporate 2 independent fire actions and no rapid fire option — **£13.95** incl. VAT and P & P



FLIGHTLINK JOYSTICK — **£10.50**

with 2 independent fire actions — incl. VAT and P & P

CURRAH μSPEECH UNIT — **£29.95**

fits into COMCON extension slot — incl. VAT and P & P

Dealer Enquiries Welcome
Phone Ludlow (0584) 4894

ALSO AVAILABLE FROM SELECTED RETAIL OUTLETS

Send to

FREL LTD. Hockeys Mill, Temeside, Ludlow, Shropshire SY8 1PD

Mr/Mrs/Miss ____________

Address ____________

Postcode ____________

Qty	Code	Item	Item Price	Total £
	01	Comcon Interface	@ £19.95	
	02	Flightlink Joystick	@ £10.50	
	03	Quickshot 2+2 Joystick	@ £13.95	
	04	Comcon + Quickshot 2+2	@ £31.90	
	05	Comcon + Flightlink	@ £28.45	
	06	Currah μSpeech unit	@ £29.95	

enclose a cheque/postal order made payable to FREL LTD for £

COMCON

RSD Connections Ltd

CONNECTORS IDC

	Card Edge	(Transition) PCB	2 Row Socket
10 way	£1.20	£0.85	£0.80
14 way	–	–	£0.90
16 way	£1.60	£1.20	£1.00
20 way	£1.90	£1.35	£1.20
26 way	£2.40	£1.60	£1.45
34 way	£3.10	£1.95	£1.60
40 way	£3.40	£2.40	£1.95
50 way	£3.85	£2.25	£2.00
60 way	£4.80	£2.60	£2.25

IDC SHROUDED HEADERS WITH EJECTING LOCKING ARMS

	Straight 85	Right Angle 90
10 way		
14 way	£1.06	£1.30
16 way	£1.25	£1.45
20 way	£1.40	£1.60
26 way	£1.70	£1.95
34 way	£2.06	£2.30
40 way	£2.15	£2.45
50 way	£2.30	£2.65
60 way	£2.45	£2.85

IDC D CONNECTORS

	Male	Female
9 way	£2.70	£3.20
15 way	£3.20	£3.70
25 way	£3.80	£4.45
37 way	£5.50	£6.80

IDC AMPHENOL

(Centronics)

36 way plug	£4.95
36-way socket	£5.95

D CONNECTORS

Solder Bucket	Male	Female
9-way	.75	£1.00
15-way	.95	£1.50
25 way	£1.50	£1.90
37 way	£2.40	£3.21

HOODS .95

PRINTER LEADS

ALL 1 METRE LENGTH

BBC	£9.95
BBC serial	£8.95
AMSTRAD	£16.75
MEMOTECH	£12.75
EINSTEIN	£12.75
IBM PCC	£15.95
SPECTRUM interface 1 to RS 232	£9.75
SPECTRUM interface 1 to Centronics	£10.75
CENTRONICS to Centronics	£15.20
DRAGON	£9.95
QL	£10.75

COMPUTER LEADS

Dual disk drive 1m	£10.25
Single disk drive 1m	£7.25
7 pin DIN plug to 2x3.5mm 1x2.5m Jack plugs	£2.25
5 Pin DIN plug to 2x3.5mm 1x2.5mm Jack plugs	£2.20
6 Pin DIN Plug to 6 Pin DIN Plug	£1.95
2x3.5mm Jack plugs to 2x3.5mm Jack plugs to	£1.20
7 Pin DIN plug to 5 pin DIN plug	£1.95
7 Pin DIN Plug to 3 pin DIN plug and 2.5mm Jack plug	£2.25
7 Pin DIN plug to 7 Pin DIN plug	£2.25
5 Pin Domino Plug to 5 pin Domino plug	£1.95
Phono Plug to Coaxial TV Aerial plug	65p

RIBBON CABLE (Price per ft)

	Grey	Rainbow
9 way	.13	.24
10 way	.15	.28
14 way	.18	.32
15 way	.20	.36
16 way	.22	.40
20 way	.30	.50
24 way	.36	.60
25 way	.40	.65
26 way	.45	.70
34 way	.60	.80
37 way	.65	.85
50 way	.75	.90
50 way	.95	£1.25
60 way	£1.10	£1.40
64 way	£1.15	£1.50

DIP HEADERS

Pins	
14	90p
16	£1.00
24	£1.40
28	£3.95
40	£2.15

EDGE CONNECTORS

2x23 way ZX81	£1.85
2x28 way Spectrum	£2.10
2x6 way Commodore	£1.20
2x12 way	£1.60

DOUBLE SIDED PLUG BOARDS

2X8123 way	£1.25
Spectrum 28 way	£1.50

TELEPHONE CONNS

Surface master jack socket	£3.75
Surface extn socket	£2.50
Dualoutlet adaptor	£4.25
Line jack cord adptr	£1.85
BT jack plug	48p
4 core cable per metre	15p

All surface units shuttered BT approved

MONITOR LEADS

BBC 6-pin to start plug	£4.95
BBC plug to phono plug	£2.06
QL to colour monitor	£4.95
QL to mono monitor	£1.25
QL to Ferguson	£2.50
BBC to Ferguson	£2.50

BBC JOYSTICK DELUXE JOYSTICK for BBC MICRO. Fits directly into BBC Micro analogue port — £12.95

SPECTRUM EXTENSION LEADS

6 inch extension cable M to F	£10.50
6 inch F to 2M's	£14.75
12 inch extension cable M to F	£16.75

Other configurations made to order. Write or phone for quote

CUSTOM ASSEMBLIES

ANY COMBINATION OF LEADS MADE TO ORDER

TRADE ENQUIRIES WELCOME

Please add 15% VAT — *Free p&p. C.W.O. or use*

RSD Connections Ltd., Dept YC2, PO Box 1, Ware, Herts. Telephone: 0920 5285
Formerly COMPUTER LINK UK LTD

HIRE SPECTRUM SOFTWARE

OVER 280 different tapes for hire including **ARCADE, ADVENTURE, BUSINESS, EDUCATIONAL**, etc. –even an m/c Compiler. **FREE** 26 page catalogue. **FREE** newsletter, with hints, tips and our top tape chart.

OVER 3000 tapes in stock, with up to 60 copies of each title for fast service. All tapes sent by 1st class post.

LOWEST PRICES – hire up to 3 tapes at a time, from 63p each for two weeks hire. (Plus p&p and VAT). European members welcome.

Tapes for sale at DISCOUNT prices. Telephone 01-661 9240 (9am - 5pm) or write for further details, or complete the coupon and **JOIN TODAY** – you've nothing to lose!

SAVE £3.00!!

For a limited period, we are offering **HALF-PRICE** membership to readers of this magazine. Join now, **LIFE** membership is only £3.00 (normally £6.00).

SWOP SHOP

A new service from N.S.L. **SWOP** your unwanted tapes with tapes from other members for a small handling charge of only 60p (plus p&p and VAT).

NATIONAL SOFTWARE LIBRARY

42 Harefield Avenue, Cheam, Surrey SM2 7NE.

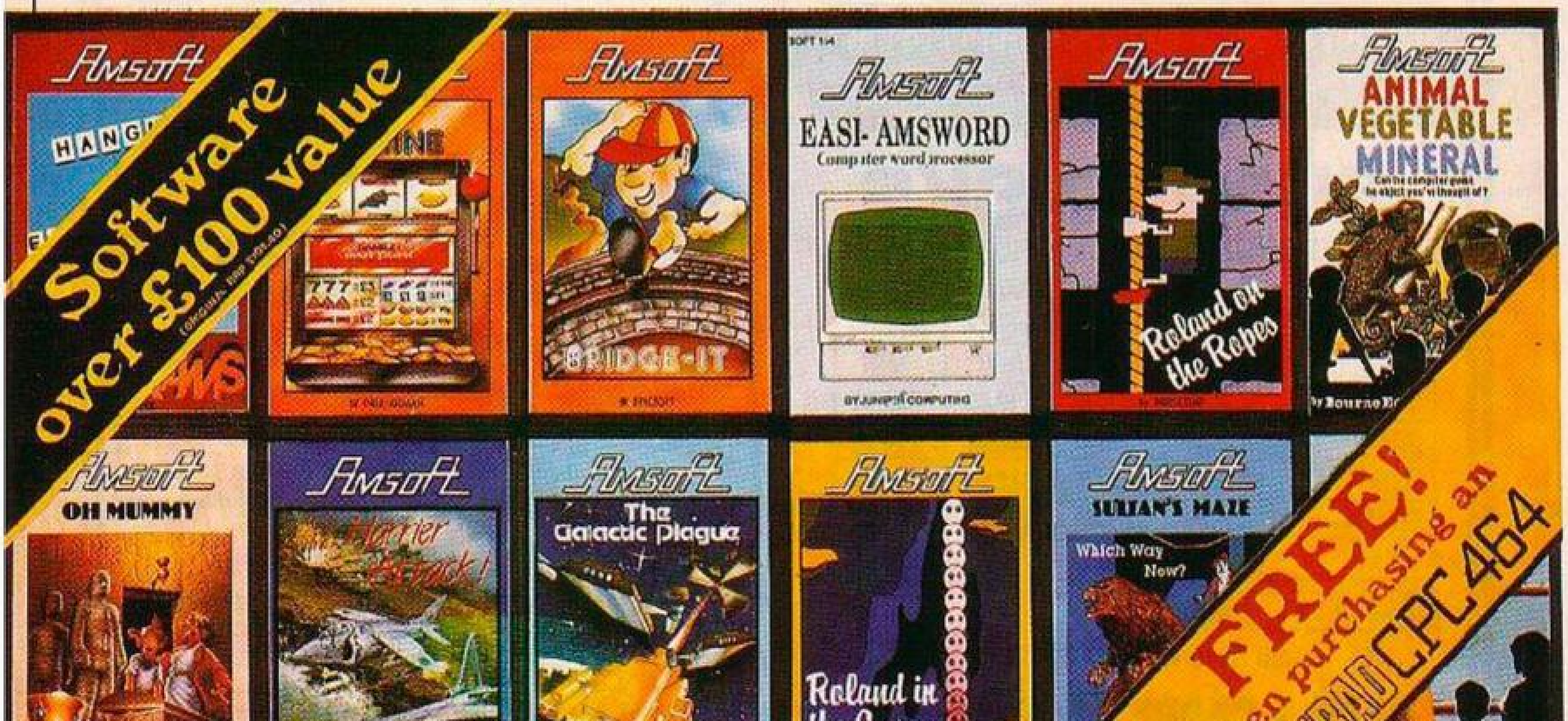
I enclose cheque/postal order for £3.00 for LIFE membership. Please rush my membership kit to me. If, within 28 days, I'm not delighted with your service you'll refund my membership fee.

Name ____________

Address ____________

YC2

Now Amstrad gives you over £100 to play with.



£239
complete with green screen VDU (GT64)

£349
complete with colour monitor (CTM640)

CPC464
complete
with
monitor
and
datacorder

Join in the fun.

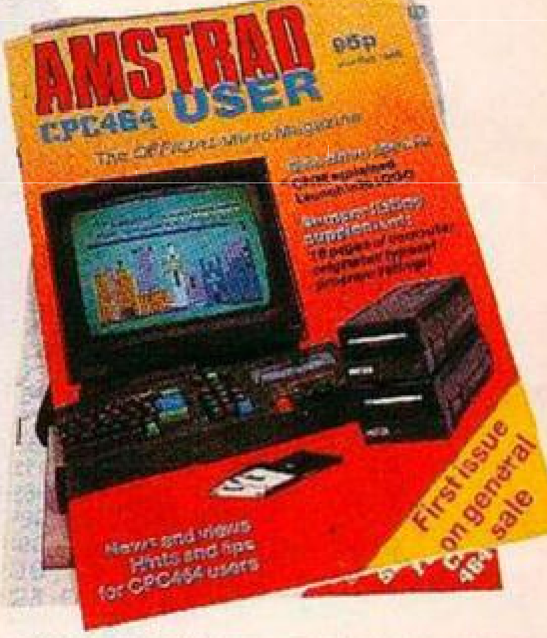
Our CPC 464 User Club is a must for all owners.

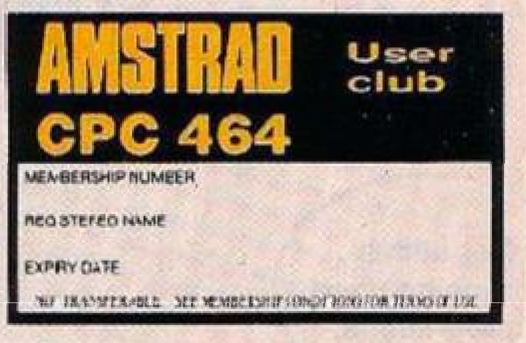
As a member, you'll be the first to know about the additions to the range. Hardware and software.

We'll provide you with your own privilege card and send you free, a year's subscription to the Amstrad User magazine packed with programs, features and information.

You can enter competitions for valuable prizes and keep up with all the latest Amstrad developments.

And with the free software pack, we think that's pretty good for starters.



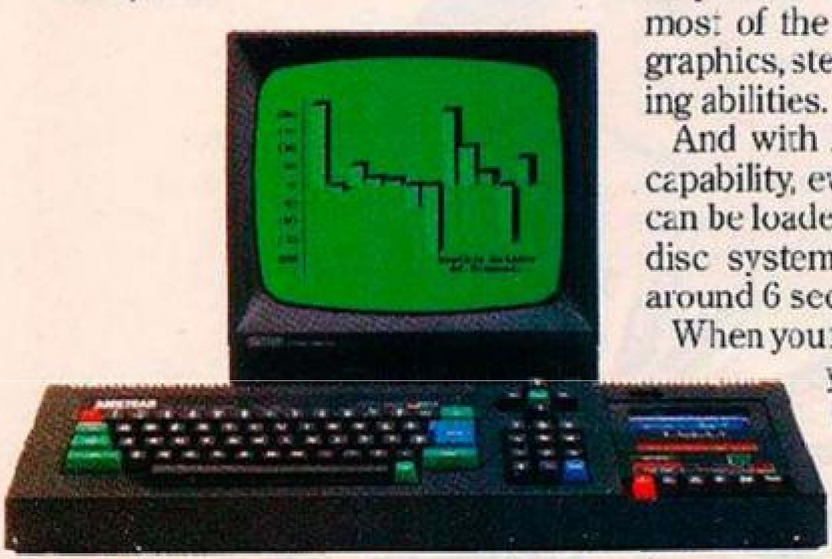


Free software worth over £100 is the name of the game.

Along with your new CPC 464 (colour monitor or green screen VDU) you'll receive a software starter pack of 12 (yes, twelve) cassettes absolutely free.

There's something for everyone. From Roland-on-the-Ropes to Easi-Amsword word processing.

That's *one* good reason for making Amstrad's CPC 464 your new home computer.



CPC 464 green screen VDU (GT64)

Here are the others.

The CPC 464 comes complete with its own colour monitor or green screen VDU and built-in cassette data recorder. (Optional disc drives are now available with CP/M* and DR. LOGO* supplied as standard.)

It has a typewriter-style keyboard and numeric keypad. 64K of RAM, 32K of ROM and a very fast extended BASIC with real time features.

And it costs a great deal less than the price of a comparable system.

The CPC 464 can handle the trickiest computer games (if you can), revision for exams, cataloguing and budgeting.

And it comes complete and ready-to-go.

Amsoft. A ton of software.

Yes. Now there are over 100 titles from Amsoft and independent publishers. And the list is still growing.

Arcade games, educational programs and business applications – they're all designed to make the most of the CPC 464's impressive graphics, stereo sound and processing abilities.

And with Amstrad's *speedloading* capability, even complex programs can be loaded quickly. The optional disc system will load a game in around 6 seconds.

When you feel the need to upgrade your Amstrad system to disc drive, just send your favourite Amsoft cassettes to us and we'll send you back the same Amsoft programs on Amsoft disc for just £4.95 per cassette, the price of a blank disc.

AMSTRAD

ONE GREAT IDEA AFTER ANOTHER

BOOTS COMET Currys Dixons Greens John Menzies RUMBELOWS spectrum WHSMITH WIGFALLS WOOLWORTH AND OTHER COMPUTER STORES

*CP/M and DR LOGO are Trade Marks of Digital Research

I'd like to know more about the exciting CPC 464 complete computer system. Please send me literature right away.

NAME

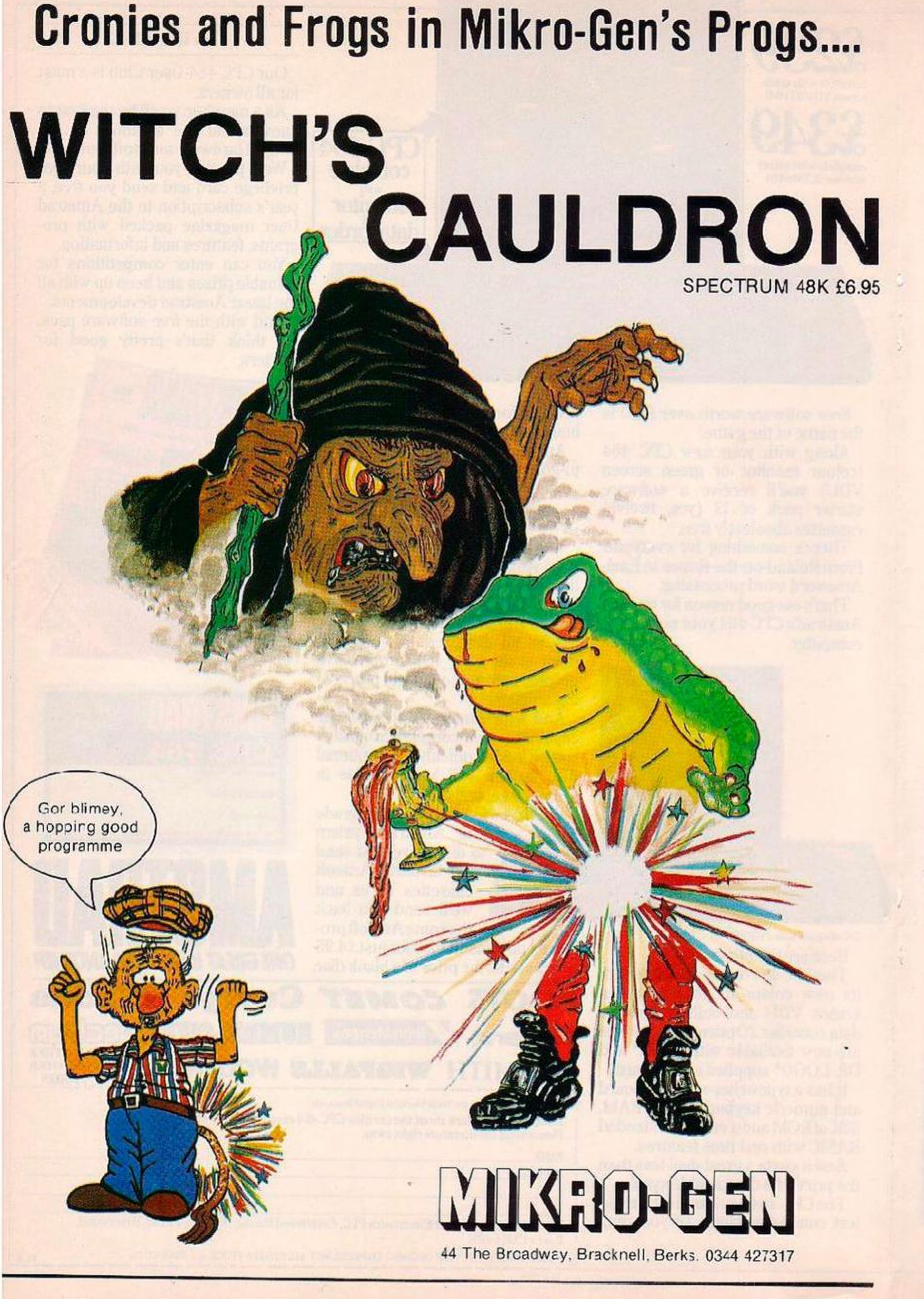
ADDRESS

POSTCODE

To: Amstrad Consumer Electronics PLC, Brentwood House, 169 King's Road, Brentwood, Essex CM14 4EF.

PRICES CORRECT AT TIME OF GOING TO PRESS. NOT ALL STORES STOCK ALL PRODUCTS.

YC6


Cronies and Frogs in Mikro-Gen's Progs....
WITCH'S CAULDRON
SPECTRUM 48K £6.95
Gor blimey, a hopping good programme
MIKRO-GEN
44 The Broadway, Bracknell, Berks. 0344 427317

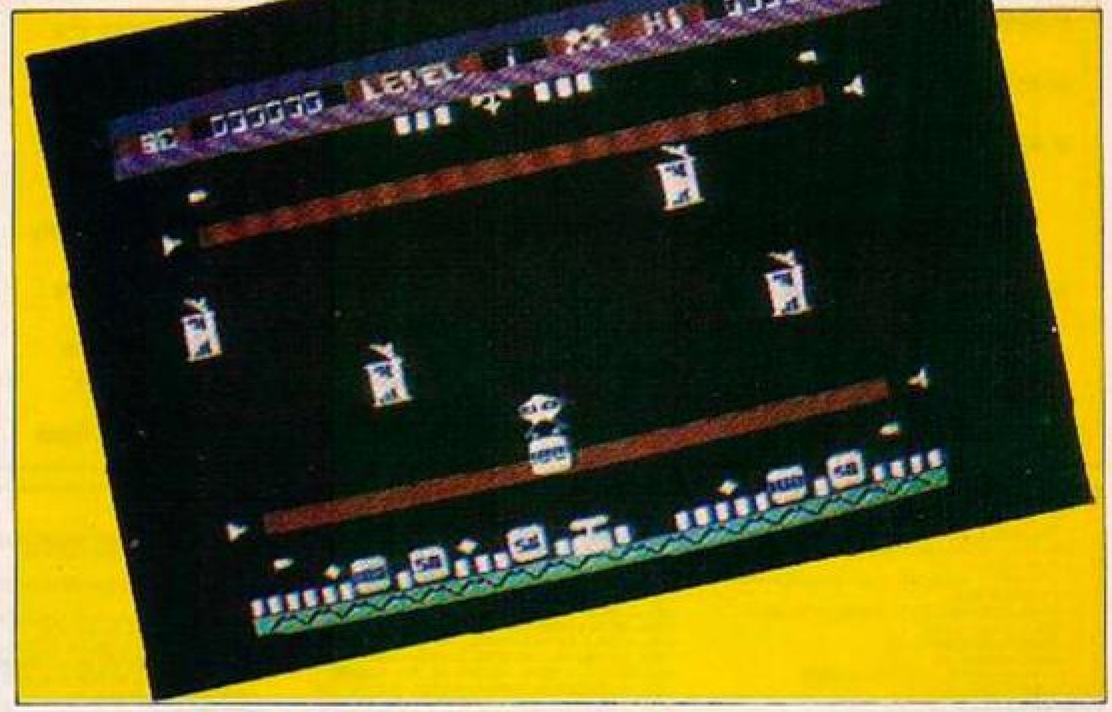
LIFE IS HARD at the spaceport, especially if you're the pilot of a balloon hopper, and especially now the spaceport has had a refit. What with the new intake of cargo and new processing techniques, it's a wonder I don't bite the spacedust more than I do

Way back in September 1983, there was a short program published in *Your Computer* called Baloon Hopper, by Andrew Foord. This well-presented little game had lots of potential and all it needed was someone to expand and develop the game. This all machine-code version for the Oric-1, called Hero-Zero, is the result.

Anyway, the control keys are Z and X — left and right — and ' and / — up and down. Drifting from left to right are various objects ranging from dustbins to ice-creams. At the bottom of the screen are cargo boxes sitting on swampy ground — yes, I know, there's no ground in space, but remember this is only a game. Located at each side of the screen are two sets of pods or conducters. These "arc" across at regular intervals and remain on for the same amount of time as they are off.

At the centre of the top of the screen is a type of homebase. This is where Hero-Zero needs to go in order to collect the points from the cargo. In each corner of the screen are spikes which deter movement around the perimeter. In the centre of the swampy ground is a button. The idea is that you can stop the arcing of the pods by picking up a seed from the cargo area, taking it up to the homebase then pressing down the button. On levels 1 to 4 this gives 17 seconds relatively free movement and on level 5, 10 seconds and level 6, eight seconds.

Just to remind you, the idea of the game is that you control Hero-Zero around the screen picking up cargo and taking it to the top of the screen.



HERO ZERO

Hard times at the space port. Float off with Jonathan Richards.

16K Oric owners cannot use the program unless serious modifications are carried out. Even so, a 16K version is available on tape if you specify this.

The hexdumps shown consist of the data code — # 8000 to # 9050 — and the game code — # 9F00 to # AC30. To start entering in the hex you can use the hexloader shown or alternatively, you can use what I used. This was to enter the disassembler and save it to tape, then add the following lines:

```
20000 FOR I = start TO finish
20010 PRINT HEX$(I),INPUT A:POKE I,A
20020 NEXT I
```

I would then Run 20000, and then start or continue typing in the hex, stopping at regular intervals to check for errors using the hexdump or disassembler

Once the data has been typed in you can save it to tape using:

CSAVE"DATA",A # 8000,E # 9050

Again, once the code has been typed in you can save it to tape using:

CSAVE"CODE",A # 9F00,E # AC30

If you think it's relatively bug free now, then you can start the game by typing:

CALL # 8FF5

As usual, tapes are available for £3.00 which contain Hero-Zero, the disassembler and the hexloader. A leaflet is also supplied giving details of the Oric Rom routines and how to use them.

Make cheques or postal orders payable to Jonathan Richards, and send them to Prosoft, 12 Mendip Close, Great Sutton, South Wirral, Cheshire L66 4SE.

Table 1. Zero Page Variables.

Note: All values are given in hexadecimal

67 — HZ Horiz Counter.
68 — HZ Vert Counter.
69 — No of aliens on screen (NOAS).
6A — NOAS Replica.
6B — Toggle Location.
6C — Cargo Screen add. LSB.
6D — Cargo Screen add. MSB.
6E — Cargo Data add. LSB.
6F — Cargo Data add. MSB.
70 — Aline one screen add. LSB.
71 — Alien one screen add. MSB.
72 — Alien two screen add. LSB.
73 — Alien two screen add. MSB.
74 — Alien three screen add. LSB.
75 — Alien three screen add. MSB.
76 — Alien four screen add. LSB.
77 — Alien four screen add. MSB.
7E — Alien Data add. LSB.
7F — Alien Data add. MSB.
80 — HZ Screen add. LSB.
81 — HZ Screen add. MSB.

Table 2. Hero-Zero data breakdown.

Address		Bytes
# 8000-# 8438	Titlescreen	1080
# 8440-# 8878	Gamescreen	1080
# 8900-# 8BF0	Character set	752
# 8BF1-# 8C20	Dustbin chars	47
# 8C21-# 8C50	Tardis chars	47
# 8C52-# 8C81	Clock chars	47
# 8C82-# 8CB1	Balloon chars	47
# 8CB2-# 8E08	Icecream chars	47
# 8CE1-# 8D10	Cup chars	47
# 8D11-# 8D61	Level 1 Cargo	80
# 8D62-# 8DB2	Level 2 Cargo	80
# 8DB3-# 8E03	Level 3 Cargo	80
# 8E04-# 8E54	Level 4 Cargo	80
# 8E55-# 8EA5	Level 5 Cargo	80
# 8EA6-# 8EF6	Level 6 Cargo	80

```
1 REM *** HEXLOADER ***
2 REM (c) PROSOFT 1984
3 REM
4 REM USE '(' TO DECREMENT ADD
5 REM USE 'Z' TO END
6 REM
10 CLS:PAPER4:INK7
15 GOSUB1000
20 PRINT:PRINT"              HEX-LOADER"
30 PRINT:PRINT:INPUT" ENTER START ADDRES
S   ";S:IFS<0ORS>#FFFFTHENGOTO10
40 PRINT:INPUT" AND THE END ADDRESS   ";
E:IFE<0ORE>#FFFFTHENPRINTCHR$(7):GOTO40
45 CLS:PRINT:PRINT"START - ";HEX$(S)
46 PRINT"END   - ";HEX$(E):PRINT:PRINT
47 DOKE621,48162:POKE623,25:CLS
50 FORX=STOE
60 PRINTHEX$(X);"   ";:INPUTH$
70 DTA=0
75 IFH$="("THENX=X-2
76 IFH$="Z"THENPRINT:PRINT:PRINT"COMPLE
TE":DOKE621,48000:POKE623,27:END
80 IFLEN(H$)>2THENGOTO60
100 L$=LEFT$(H$,1):R$=RIGHT$(H$,1)
110 FORJ=0TO15
111 B$=A$(J)
115 IFB$=L$THENDTA=DTA+16*J
120 IFB$=R$THENDTA=DTA+J
130 NEXTJ
140 POKEX,DTA:NEXTX
150 DOKE621,48000:POKE623,27:END
1000 DIMA$(15)
1010 FORN=0TO9:A$(N)=RIGHT$(STR$(N),1):N
EXT
1020 FORN=10TO15:A$(N)=CHR$(N+55):NEXT
1030 RETURN
```

Table 3.

8FF5-Startup — Loads the character set and the titlescreen. Waits for space bar to be pressed and starts initialisation, then jumps to main routine loop.
9F00-Mainloop — Calls service routines and monitors timing for aliens and arcs.
9FE1-Movement — Detects key press and moves HZ around the screen.

(Table 3 continued on next page)

(Table 3 continued from previous page)

Uses # 208 for reading keyboard.

A15E-Pickup – Checks to pickup something and prints it below HZ.

A25F-Movealien – Prints four aliens in 2 by 3 format at various positions around the screen. Collects data for characters from HZ buffer — # BFE0 - # BFFF.

A450-Window – Checks for HZ moving off the screen in the four directions. Copes for HZ with cargo.

A600-Printarc – Prints arcs onto the screen.

A60D-Wipearc – Wipes arc from the screen.

A640-Setup – Initialiisation routine that puts HZ variables and characters into memory locations

A723-Arckill – Checks when HZ crosses the arc boundary.

A742-Inc50 – Increments the score by 50.

A752-Inc100 – Increments the score by 100.

A762-Plus1 – Increments the score variables by 1 in BCD. Used by Inc50 and Inc100.

A77EE-PrntSC – Converts score from BCD to ASCII code and prints this to the screen.

A7C4-Compare – Determines whether current score is higher than the high score.

A804-PrntHI – Prints high score onto the screen and uses the same techniques as PrntSC but for a different part of the screen.

A8CA-Dwnldchr$ – Down loads the new character set.

A8E6-Dwnldtitle – Down loads the title screen.

A902-Dwnldgme – Down loads the game screen.

[illegible]

Hex dump. Game data.

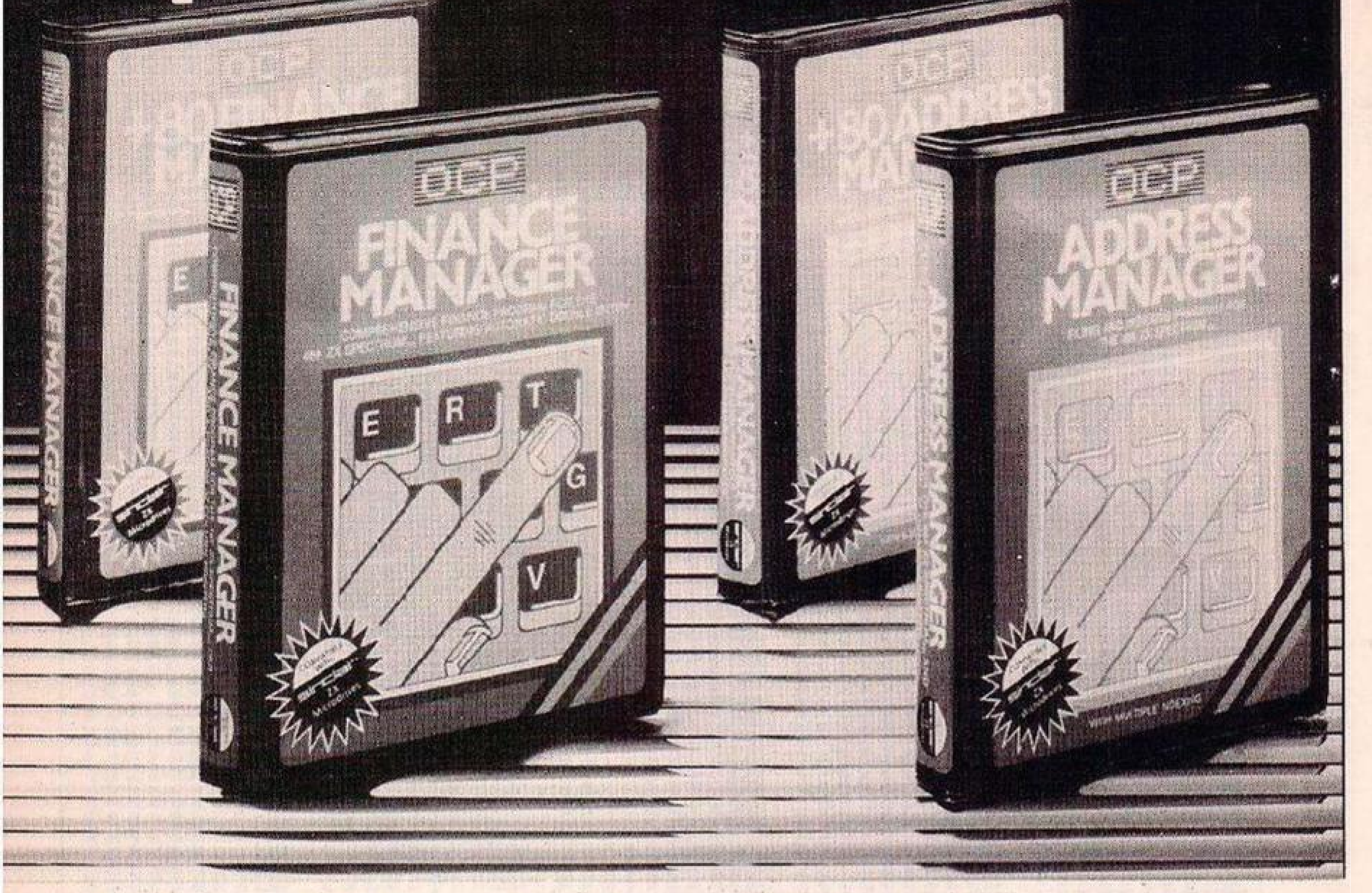
[illegible]

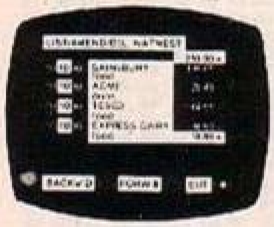
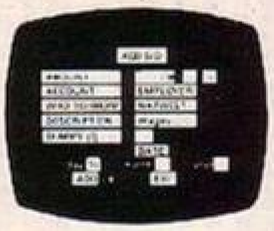
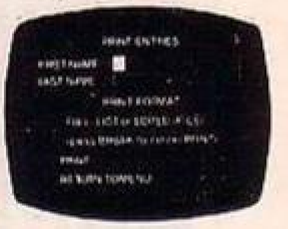
(continued on next page)

(continued from previous page)

Main code.

Spectrum + OCP me



If you've got a 48K Spectrum™ and accounts to manage, OCP will make the job easier and faster.

All our business and utility programs are Sinclair Microdrive Compatible, and the Plus 80 versions are versatile enough to drive full size 80 Column Printers through most Centronics and RS 232 Interfaces including the ZX Interface 1. However, our standard programs (except Stock Manager) only work with ZX and Alphacom 32 Column printers.

The magic of MACHINE CODE has enabled us to produce the very latest "on the page" presentation which lets you enter and edit data naturally, as if filling in a form.

FINANCE MANAGER £8.95 PLUS 80 £19.95

Voted the best in its class by the Sinclair Users Annual, this easy to use program is a powerful and flexible aid to practically all domestic and business accounting applications. Show up to 255 separate accounts with running totals, and review standing orders as you scroll back and forth through your accounts. But that's not all, this program automatically raises a corresponding debit or credit for every entry, and will even open a new account if an entry features an unrecorded account name.

Having all your finance records so neatly stored is the height of efficiency! The program is entirely menu driven for ease of operation, yet the facilities are so extensive you'll soon wonder how you managed without it.

ADDRESS MANAGER £8.95 PLUS 80 £19.95

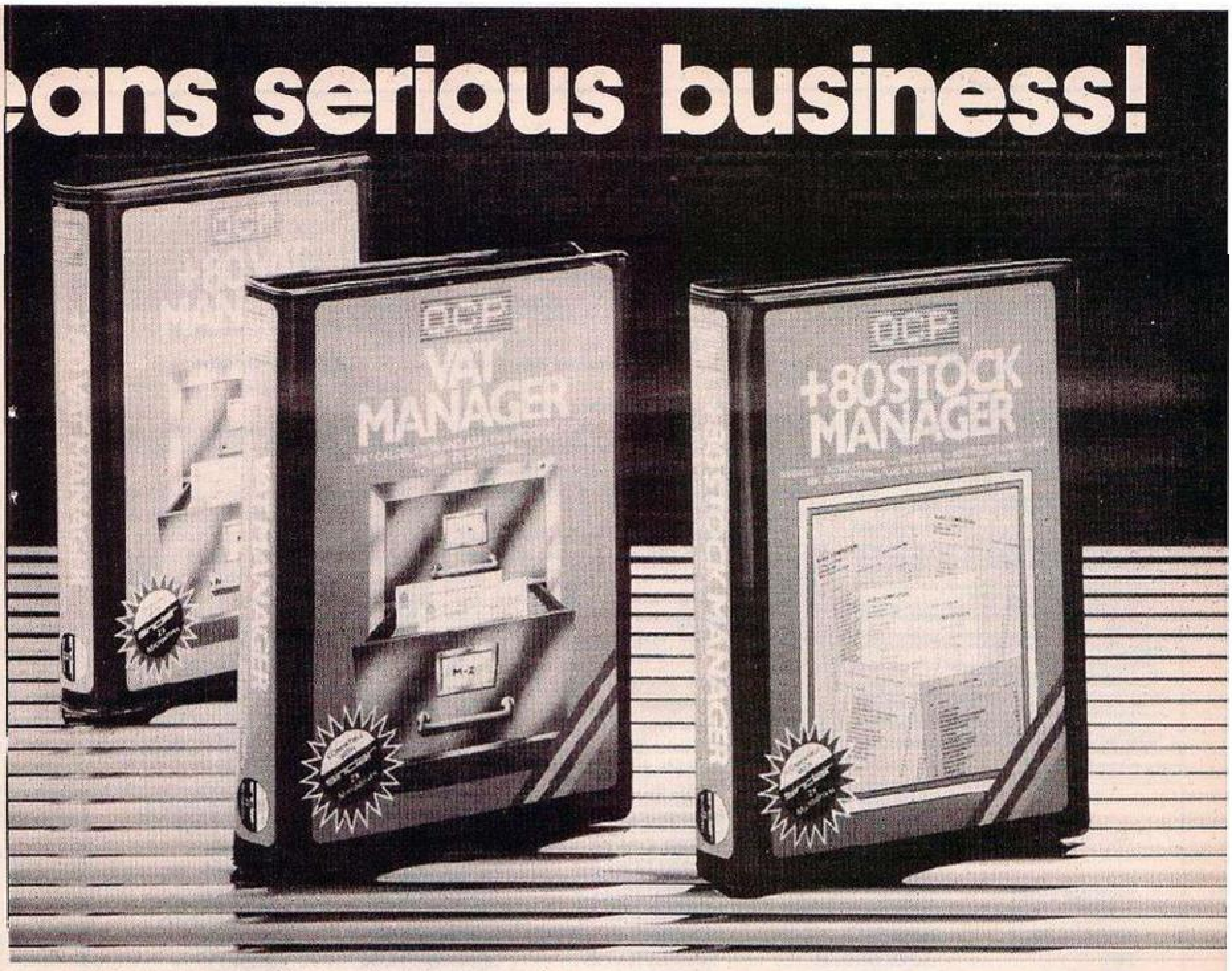
A very useful MACHINE CODE application program with limitless applications at work and at home.

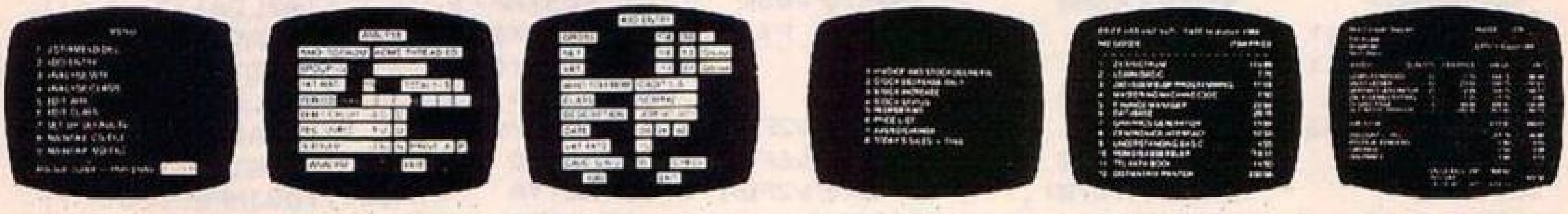
Manage your address book with efficiency and speed! Address Manager stores up to 350 names, addresses, and phone numbers – depending on their length. Or up to 1200 individual names/titles/references. The Plus 80 version also embodies a comprehensive Label Printing routine.

In the office, Address Manager can store internal phone directories, store and analyse customer's records, and much much more.

If you've already got Finance Manager and/or Address Manager but in non-Microdrive format, and you'd like to update them, we'll give you a £3 rebate towards the cost of a Microdrive Compatible 32 Column, or £5 off the Plus 80 version. This offer is available via mail order only.

The OCP range includes: VAT Manager, Address Manager, Finance Manager, Stock Manager (80 Column only).





VAT MANAGER £8.95 PLUS 80 £19.95

Your VAT 100 return need no longer be a headache! Simply key in the Gross or Net values of all the period's sales and purchase invoices and VAT Manager will check, analyse and total all the relevant details. Available in 32 Column or Plus 80 versions, VAT Manager will check all calculations automatically, and will even work out details of exempt totals where the trader is not required to pay VAT. This is performed with its CLASSIFY feature for types of transactions and GROUP feature for more detailed analysis.

PLUS 80 STOCK MANAGER £19.95

Provides a controlled stock environment for up to 600 different product lines.

The program has facilities for the production of invoices, sales totals, price lists, and shows stock status, stock adjustment and re-order requirements.

No business should be without this crucial Microdrive program. Now you can compute your entire stock balances all on one program – Stock Management has never been so easy! Coupled with a suitable printer it will take advantage of the 80 column width printout to produce quality hard copy.

Now the most helpful aids to business efficiency are as near as your local software stockist. Call in soon and see the latest in OCP's exciting range of business software. Available from larger branches of WHSMITH, Boots or mail order direct.

For instant purchase contact the OCP Hotline with your Access details. Telephone: 0753 889 055

OCP

Simply The Best

4 High Street, Chalfont-St-Peter, Bucks SL9 9QB

Our Utilities include: Machine Code Test Tool, Editor/Assembler and Master Tool Kit.

Program 2.

```
[illegible]
```

Program 1.

```
[illegible]
```

THE IDEA OF this game is to cross the screen and collect the bags of swag and return with them to the get away car. You will be hampered by falling bombs and aided by stone defences. Each level more bombs will fall and after a specified number of points either one or two blocks will be renewed. Also on each level the program will play a new tune — it knows four different ones.

The program is in three parts, though there are four parts to type in. The first part loads the others and sets up the UDG's and Envelopes. The second part makes the machine code and stores the multi-coloured characters. The final part is the Basic program.

Typing in the program is done as follows:

Type in program 1 and save it as "Holdup". Now type in program 2, Run it, type New and enter program 3 and Run it. Now save the code made by these programs with:

*SAVE Hold-Up 2981 2FFF

Now type in program 4 and save it as "Hold-Up".

When loading the program make sure the DFS is disabled as the program sets Page to &D00.

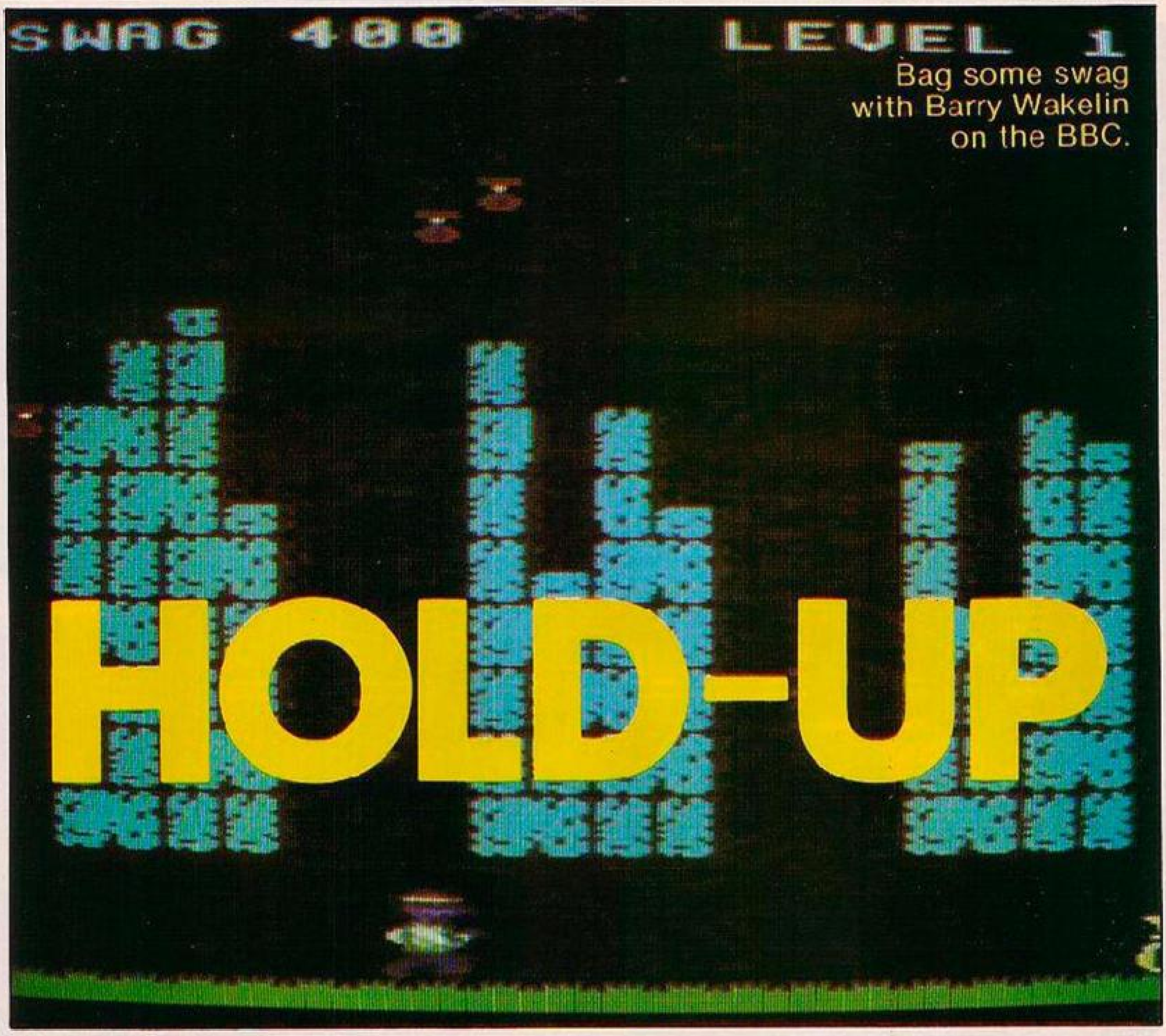
Storing high and low bytes for the machine code is made easier and quicker by directly accessing the resident integer variables. These variables are stored from &400 onwards and each one takes up four bytes. So A% is at &400, B% is at &404 and so on.

When the game isn't being played the computer will show either the high score table or the instructions. These will be flicked between when the scrolling message at the top of the screen is finished. To toggle between them at any time press Escape.

To change the difficulty of the game press C on one of the above screens.

Program 3.

```
10MODE1:HI
  MEM=&2980
20P%=&2F01
30[
40LDY#&1F
50LDA&2FE0,Y
60STA(&70),Y
70DEY
80BPL P%-&06
90RTS
100BRK
110LDY#&1F
120LDA#&00
130STA(&70),Y
140DEY
150BPL P%-&03
160RTS
170BRK
180LDA#&E0
190STA&70
200LDA#&7A
210STA&71
220LDA#&00
230STA&6F
240LDY#&00
250LDA(&70),Y
260CMP#&01
270BEQ P%+&1C
280SEC
290LDA&70
300SBC#&20
310STA&70
320LDA&71
330SBC#&00
340STA&71
350CMP#&34
360BNE P%-&17
370LDA&70
380CMP#&E0
390BNE P%-&1D
400JMP&2F7A
410JSR&2F0D
420CLC
430LDA&70
440ADC#&80
450STA&70
460LDA&71
470ADC#&02
480STA&71
490LDY#&00
500LDA(&70),Y
510CMP#&14
520BEQ P%+&15
530JSR&2F01
540SEC
550LDA&70
560SBC#&A0
570STA&70
580LDA&71
590SBC#&02
600STA&71
610JMP&2F39
620JSR&2F0D
630INC&6F
640JMP&2F61
650BRK
660LDA#&00
670STA&70
680LDA#&7B
690STA&71
700LDY#&00
710LDA(&70),Y
720CMP#&01
730BEQ P%+&1B
740CLC
750LDA&70
760ADC#&20
770STA&70
780LDA&71
790ADC#&00
800STA&71
810CMP#&7D
820BNE P%-&17
830LDA&70
840CMP#&80
850BNE P%-&1D
860RTS
870BRK
880JSR&2F0D
890INC&6F
900JMP&2F8A
910BRK
920LDX#&03
930LDY#&3F
940LDA(&74),Y
950STA(&72),Y
960DEY
970BPL P%-&05
980CLC
990LDA&72
1000ADC#&80
1010STA&72
1020LDA&73
1030ADC#&02
1040STA&73
1050CLC
1060LDA&74
1070ADC#&40
1080STA&74
1090LDA&75
1100ADC#&00
1110STA&75
1120DEX
1130BNE P%-&24
1140RTS
1150]
1160P%=&2B01
1170[
1180SEC
1190LDA&72
1200SBC#&08
1210STA&72
1220LDA&73
1230SBC#&00
1240STA&73
1250LDX#&03
1260LDY#&38
1270LDA(&72),Y
1280CMP#&01
1290BEQ P%+&3A
1300TYA
1310SEC
1320SBC#&08
1330TAY
1340BPL P%-&0B
1350LDA&0420
1360BEQ P%+&2D
1370CMP#&08
1380BEQ P%+&2D
1390CLC
1400LDA&72
1410ADC#&08
1420STA&72
1430LDA&73
1440ADC#&00
1450STA&73
1460LDX#&03
1470LDY#&00
1480LDA(&72),Y
1490CMP#&03
1500BEQ P%+&13
1510CLC
1520LDA&72
1530ADC#&80
1540STA&72
1550LDA&73
1560ADC#&02
1570STA&73
1580DEX
1590BNE P%-&14
1600RTS
1610INC&76
1620RTS
1630CLC
1640LDA&72
1650ADC#&48
1660STA&72
1670LDA&73
1680ADC#&00
1690STA&73
1700JMP&2B35
1710BRK
1720LDA#&E0
1730STA&70
1740LDA#&7A
1750STA&71
1760LDY#&00
1770LDA(&70),Y
1780CMP#&01
1790BEQ P%+&1A
1800SEC
1810LDA&70
1820SBC#&20
1830STA&70
1840LDA&71
1850SBC#&00
1860STA&71
1870CMP#&34
1880BNE P%-&17
1890LDA&70
1900CMP#&E0
1910BNE P%-&1D
1920RTS
1930JSR&2F0D
1940JMP&2B74
1950]
```

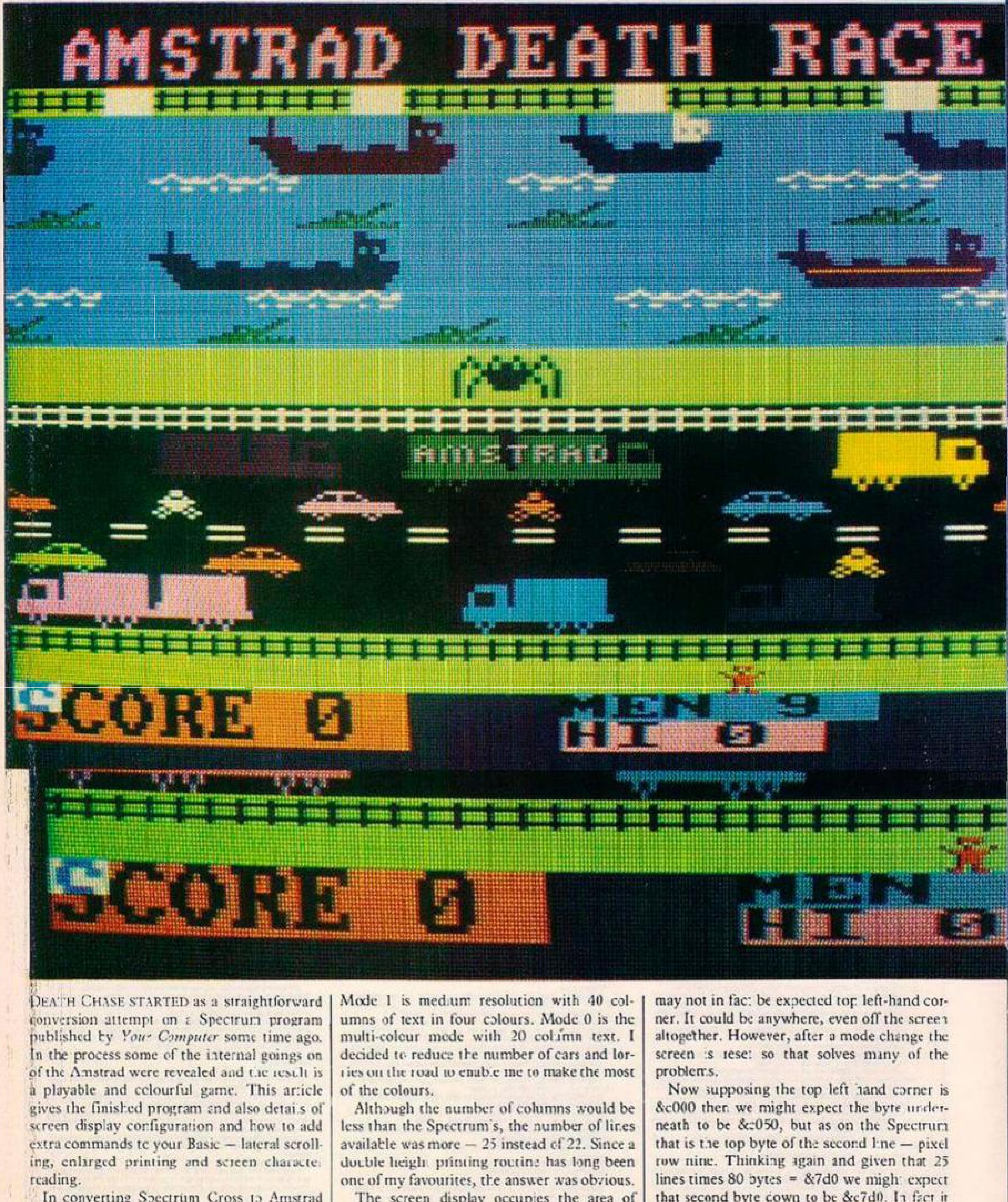


HOLD-UP

Bag some swag with Barry Wakelin on the BBC.

Program 4.

```
10*FX14,6
20*FX229,1
[illegible]
7900Z$="........................HOLD UP by Barry Wakelin.
You, SLY SAM the bank robber, must collect the bags o
f swag thrown from the bank by your accomplices and re
turn to your base while dodging a down-pour of bombs"
8000Z$=Z$+"........................"
8010*FX9,5
8020*FX10,5
8030F$=" "+CHR$8+CHR$10+" ":ENDPROC
```



DEATH CHASE STARTED as a straightforward conversion attempt on a Spectrum program published by *Your Computer* some time ago. In the process some of the internal goings on of the Amstrad were revealed and the result is a playable and colourful game. This article gives the finished program and also details of screen display configuration and how to add extra commands to your Basic — lateral scrolling, enlarged printing and screen character reading.

In converting Spectrum Cross to Amstrad Death Race there were three fundamental problems to be faced. First the different size of the text screen, second the way the screen start moves around in memory, and third the way colour is mapped.

The Amstrad has three screen modes. Mode 2 is the high definition, two colour mode. Mode 1 is medium resolution with 40 columns of text in four colours. Mode 0 is the multi-colour mode with 20 column text. I decided to reduce the number of cars and lorries on the road to enable me to make the most of the colours.

Although the number of columns would be less than the Spectrum's, the number of lines available was more — 25 instead of 22. Since a double height printing routine has long been one of my favourites, the answer was obvious.

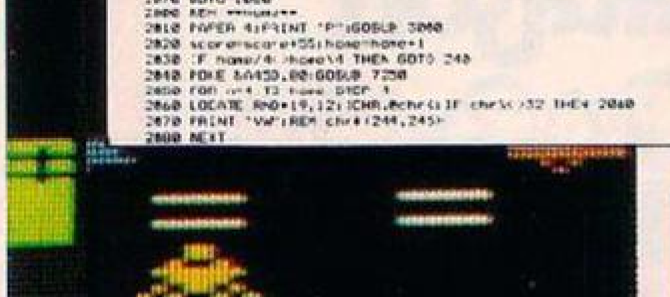
The screen display occupies the area of memory from hex & c000 up and is composed of 25 lines each with eight rows of 80 bytes. Some arithmetic tells you that there is a little memory left over at the end of the screen.

This fact, coupled with hardware scrolling of the screen when for example listing a program, means that the byte with address &c000 may not in fact be expected top left-hand corner. It could be anywhere, even off the screen altogether. However, after a mode change the screen is reset so that solves many of the problems.

Now supposing the top left hand corner is &c000 then we might expect the byte underneath to be &c050, but as on the Spectrum that is the top byte of the second line — pixel row nine. Thinking again and given that 25 lines times 80 bytes = &7d0 we might expect that second byte down to be &c7d0. In fact it is &c800. This tidy figure is arrived at by simply tagging roughly half a line on after the bottom of the screen.

Colour mapping is at its simplest in Mode 2. Here the eight pixel width of a character is matched by the eight bits in one byte. Hence 80 characters per line means 80 bytes across

```
10 '********************************
20 '*                              *
30 '*      AMSTRAD DEATH RACE      *
40 '*              by              *
50 '*          C J LEIGH           *
60 '*                              *
70 '********************************
80 '
90 ' after break run 150
100 GOSUB 10000:REM **machine code**
110 hi=0:GOSUB 9000:REM **graphics**
120 ENV 1,5,2,
130 ENV 2,10,-,2
140 ENV 3,15,-,10
150 GOSUB 8010 REM **instructions**
160 men=9:home=0:score=0:pause=100
170 GOSUB 7000 REM **screen**
200 REM **start**
210 |PRINT,12:POKE &A45D,44
220 GOSUB 5000
230 ZONE 12:chr%=0:x1=15
240 y1=23:col1%=12:x2=x1:y2=y1
250 LOCATE x1,y1:PEN 3:PAPER col1%:PRINT "P"
260 PEN 5:LOCATE 12,24:PAPER 10:PRINT "MEN";men;
270 LOCATE 12,25:PAPER 9:PRINT "HI";hi;
280 LOCATE 1,24:PAPER 11:PRINT "SCORE";score,:|PRINT,2
4
290 IF INKEY(0)=0 THEN 290
300 REM **loop**
310 IF INKEY(0)=0 THEN y2=y1-2
320 IF INKEY(1)=0 THEN x2=x1+1
330 IF x2=21 THEN x2=20
340 IF INKEY(8)=0 THEN x2=x1-1
350 IF x2=0 THEN x2=1
360 col2%=12-(7 AND y2>13 AND y2<23)-(2 AND y2>3 AND y
2<12)-(8 AND y2=3)
370 LOCATE x1,y1:PAPER col1%:PEN 3:PRINT " "
380 |LSCROLL,4,5,8,9,15,20,21
390 |RSCROLL,7,11,5,17,17
410 IF RND<0.5 THEN |LSCROLL,12,13,12,13 ELSE |RSCROLL
,2,13,12,13
420 IF home>3 THEN |RSCROLL,17:|LSCROLL,19
430 IF home>7 THEN |RSCROLL,7,11
440 IF home>11 THEN |RSCROLL,15,16,17:|LSCROLL,17,20,2
1
450 IF home>15 THEN |LSCROLL,4,5,8,9:|RSCROLL,7,11
460 PAPER col2%:LOCATE x2,y2
470 |CHR,@chr%:IF chr%<>32 THEN 1000
480 PEN 3:IF y2=3 THEN 2000
490 PRINT "P";:REM chr$(208)
500 IF y2<y1 THEN SOUND 2,30,20,15,2:score=score+5:LOC
ATE 1,24:PAPER 11:PEN 5:PRINT "SCORE";score:|PRINT,24
5,0 x1=x2:y1=y2:col1%=col2%
520 FOR N=1 TO pause:NEXT
530 GOTO 310
1000 REM **crash**
1010 SOUND 7,0,120,15,3,0,15
1020 men=men-1:IF men>0 THEN 240
1030 IF score>hi THEN hi=score
1040 LOCATE 1,22:PAPER 1:PEN 15:PRINT "     GAME OVER
   "
1050 PRINT "  Y for another.  "
1060 IF INKEY$="Y" OR INKEY$="y" THEN GOTO 150
1070 GOTO 1060
2000 REM **home**
2010 PAPER 4:PRINT "P";:GOSUB 3000
2020 score=score+55:home=home+1
2030 IF home/4<>home\4 THEN GOTO 240
2040 POKE &A45D,00:GOSUB 7250
2050 FOR n=4 TO home STEP 1
2060 LOCATE RND*19,12:|CHR,@chr%:IF chr%<>32 THEN 2060
2070 PRINT "VW";:REM chr$(244,245)
2080 NEXT
2090 IF home>16 THEN home=4:pause=2
2100 score=score+score\5
2110 GOTO 210
3000 REM **TUNE**
3010 RESTORE 3020
3020 DATA 253,,1,253,,1,190,,8 253,,85,190,,85,253,,85
,190,,85,190,1
3030 FOR N=1 TO 9:READ A,B:SOUND 2,A,10*B,8,1
3040 NEXT
3050 RETURN
6000 REM **KEY REDEFINE**
6010 RESTORE 6010:FOR n=1 TO 21:READ a:KEY DEF a,1,56+
n,224+n,192+n
6020 NEXT:RETURN
6030 DATA 69,54,62,61,58,51,52,44,75,45,37,36,38,46,34
,27,67,50,60,51,43
6040 RESTORE 6030:FOR n=1 TO 21:READ a:KEY DEF a,1,56+
n,224+n,n-11 AND n<21
6050 NEXT n:RETURN
7000 REM **screen**
7010 INK 2,1:INK 7,7:INK 6,11:INK 7,4:INK 8,15:INK 5,1
7:INK 12,19:INK 13,9:INK 11,3
7020 MODE 0:POKE &A45D,00
7030 PAPER 5:PEN 7:PRINT " AMSTRAD DEATH RACE ";:PRINT
 ;
7040 LOCATE 1,4:PAPER 10:PEN 5
7050 PAPER 10:PEN 5:PRINT "YZ    ";:PEN 8:PRINT "IYYZ
 ";:PEN 14:PRINT"IYYZ  ";:PEN 5:PRINT"X";:|PRINT 4:REM
CHR$(216,217,218),CONTROL+J&S
7060 LOCATE 2,4:PEN 4:PRINT CHR$(215):LOCATE 1,6
7070 PEN 4:PRINT "   TTT    TT    TTT  ";:REM CHR$(212)
,CONTROL M
7080 PEN 13:PRINT "  [\    [\  [\     [\";:REM CHR$(219
,220),CONTROL TU
7090 PEN 7:PRINT "   YYYZ";:PEN 5:PRINT "    YYYZ
";:|PRINT,8
7100 FOR n=0 TO 12:POKE &A9BE+n,3:NEXT
7110 PEN 4:PRINT "TT    TTT    TTT    TT";
7120 PEN 1:PRINT "[\   [\    [\    [\  ";
7130 PAPER 5:PEN 4:LOCATE 1,14:PRINT "UUUUUUUUUUUUUU
UUUU";:REM CHR$(213),P
7140 PEN 13:PRINT "LMMN    ";:PEN 1:PRINT "LMN    ";:P
EN 7:PRINT "LMMN ";:|PRINT,15:REM CHR$(204,205,206),EFG
7150 PEN 11:PRINT "  O    ";:PEN 10:PRINT "HI    ";:PEN
8:PRINT "HI    ";:PEN 4:PRINT "O  ";:PEN 9:PRINT "HI";:R
EM AI & H
7160 PEN 4:PRINT "= = = = = = = = = = = ";
7170 PEN 14:PRINT "JK   ";:PEN 1:PRINT "O    ";:PEN 12:P
RINT "JK   ";:PEN 1:PRINT "JK        ";:REM ED & H
7180 PEN 0:PRINT "  QRS    ";:PEN 9:PRINT "QRS     ";:
PEN 2:PRINT "QRS";:|PRINT,20:REM JKL
7190 DATA 01000010000110111011100110110,10101010101000
01000101001010,1 1010101010000100110011101001,10101010
10000100101010101010 101010101010100010001010101010
7200 RESTORE 7190:FOR m=1 TO 5:READ a$
7210 FOR n=1 TO LEN(a$):IF MID$(a$,n,1)="1" THEN PLOT
8+n*4,170-2*m,15
7220 NEXT:NEXT
7230 LOCATE 1,22:PEN 5:PAPER 12:PRINT "UUUUUUUUUUUUUU
UUUUU";
7240 PRINT "                        ";
7250 PAPER 12:PEN 5:LOCATE 1,3:FOR n=1 TO 20:PRINT CHR
$(213);:NEXT
7260 PAPER 4:FOR n=0 TO 3:LOCATE n*5+3,3:PRINT "  ";:NEX
T
7270 PAPER 12:PEN 5:LOCATE 1,12:PRINT "         VW
     ";:REM OP
7280 RETURN
8000 REM **instructions**
8010 INK 0,0:INK 1,24:INK 2,16:PAPER 0:PEN 1
8020 MODE 1:LOCATE 13,2:PRINT "OBJECT":PRINT:PRINT
8030 PRINT "To guide a ";:PEN 2:PRINT "P";:PEN 1:PRINT
"across a road and river, avoiding"
8040 PEN 2:PRINT "HI LMN O XYZ [\."
8050 PEN 1:PRINT:PRINT "A ";:PEN 2:PRINT "VW";:PEN 1:P
RINT " patrols the central island."
8060 PRINT:PRINT "There are four HOMES to be filled, i
.e. gaps in top fence ";
8070 PEN 2:PRINT "UU UU"
8080 PEN 1:PRINT:PRINT "Once all 4 HOMES are filled th
e speed   will increase, an extra ";
8090 PEN 2:PRINT "VW";:PEN 1:PRINT "will be added and t
he HOMES will empty."
8100 PRINT:PRINT "Use the cursor keys, but not back!"
8110 PRINT:PRINT "Press any key to continue."
8120 IF INKEY$<>"" THEN 8120
8130 IF INKEY$="" THEN 8130
8140 RETURN
9000 REM **graphics**
9010 SYMBOL 200,13,18,34,127,255,255,40,16
9020 SYMBOL 201,128,64,32,254,254,255,40,16
9030 SYMBOL 202,1,2,4,127,127,255,20,0
9040 SYMBOL 203,240,72,68,254,255,255,20,0
9050 SYMBOL 204,127,127,127,127,127,255,21,0
9060 SYMBOL 205,254,254,254,254,255,255,64,128
9070 SYMBOL 206,0,240,196,196,254,254,40,16
9080 SYMBOL 207,24,24,36,126,68,98,165,66
9090 SYMBOL 208,36,40,146,124,56,36,40,100
9100 SYMBOL 209,0,31,25,35,127,127,20,6
9110 SYMBOL 210,127,127,127,127,255,255,7,1
9120 SYMBOL 211,254,254,254,254,254,255,168,16
9130 SYMBOL 212,16,41 199,0,30,0,0,0
9140 SYMBOL 213,0,60,255,60,60,255,60,0
9150 SYMBOL 214,0,34,85,143,151,163,160,0
9160 SYMBOL 215,0,60,70,141,233,177,5,0
9170 SYMBOL 216,15,16,16,254,63,31,15,7
9180 SYMBOL 217,0,0,0 0,30,255,255,255
9190 SYMBOL 218,96,124,84,120,127,255,254,252
9200 SYMBOL 219,0,0,3 3,15,63,255,0
9210 SYMBOL 220,6,12, 52,240,224,85,255,0
9220 SYMBOL 255,96,96,124,124,84,81,128,128
9230 RETURN
10000 REM **machine code**
10010 SYMBOL AFTER 32 MEMORY &A3FF
10020 INK 0,0:INK 1,15,25:SPEED INK 30,30:MODE 0
10030 LOCATE 1,10:PRINT "PLEASE WAIT A MOMENT"
10040 RESTORE 10090
10050 FOR n=&A400 TO &A4C3
10060 READ a$:POKE n,VAL ("&"+a$)
10070 NEXT:CALL &A400
10080 RETURN
10090 DATA 01,0e,a4,21,0a,a4,cd,d1,bc,c9,00,00,00,00,1
c,a4,c3,47,a4,c3,7b,a4,c3,9c,a4,c3,bd,a4,50,52,49,4e,d
4,4c,53,43,52,4f,4c,cc,52 53,43,52,4f,4c,cc,43,48,d2,0
0
10100 DATA dd,6e,00,dd,23 dd,23,2d,26,00,29,29,29,29,e
5,d1,29,29,19,c9
10110 DATA cc,53,a4,11,00 40,19,eb,21,50,00,19,eb,0e,0
7,e5,06,04,c5
10120 DATA 0e,07,46,50,e5 d5,2e,12,23, 3,10,fa
10130 DATA d1,7e,eb,00,57 e1,06,70,ed
10140 DATA 7e,06,00,67,e1 10,e3,e1,0d,20,dc,c9
10150 DATA f5,cd,33,a4,11,00,c0,19,06,00,c5,e5,d1,23,0
1,4f,00,1a,ec,b0,12,01,b0 07,09,c1,10,ee,11,3d,20,e8,c
9
10160 DATA f5,cd,33,a4,11 4f,c0,19,06,00,c5,e5,d1,2b,0
1,4f,00,1a,ec,b8,12,01,50 00,09,c1,10,ee,11,3d,20,e8,c
9
10170 DATA d5,cd,50,bb,e1,77,c9
20000 REM **save**
20010 SPEED WRITE 1:SAVE "death race"
20020 SPEED WRITE 0:SAVE "!death race"
20030 PRINT "rewind and CAT to verify"
20040 END
```



DEATH RACE

C J Leigh with a very colourful version of Frogger for the Amstrad.

the screen. Each bit reset is paper colour — usually pen 0 — and each bit set is usually pen 1.

In Mode 1 things are more difficult since the character width covers two display bytes with each pixel pen being represented by the state of two bits, so giving the four colours available. These bits are not consecutive but the byte is split in two with the most significant bit of each half representing the leftmost pixel of the byte.

In Mode 0 the same general idea is followed. The character width covers four bytes, each byte representing two pixels. The byte is split into four with the most significant bit of each quarter representing the left hand pixel of the pair. Each of the quarters contributes a bit to a 4 bit number with the bits weighted 1,4,2,8 indicating the pen number used.

Extensions to Amstrad Basic can be made very easily by setting up a name table and jump table as in listing 1 along with a four byte buffer and the log on routine at &a400. Each command must be preceded by a bar character available on the @ key.

The scrolling routines are straightforward whilst the double height printing routine is used after the Rom has printed to the screen. The machine code reads the bytes of colour off the screen and doubles them up. Screen character reading is done using a Rom system call.

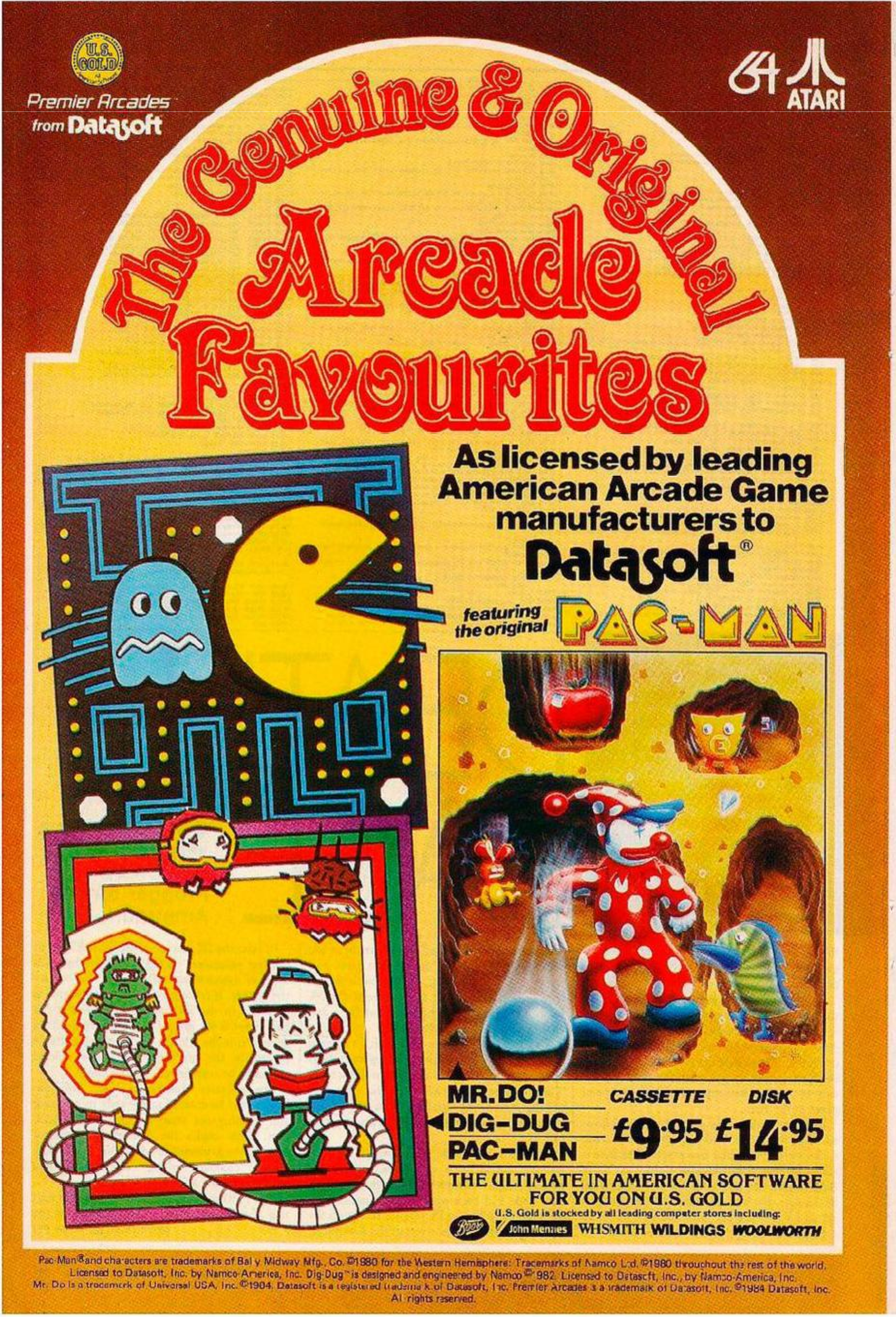
Using machine code in this way is very attractive and is made even easier since it is possible to pass parameters from Basic to your own code and back again. These parameters are pointed to by the IX register pair with the number of parameters given in the A register.

In fact, the IX pair point to the low byte of the last parameter passed and is the base address of a parameter buffer set up for you by the system. If there is only one parameter it is available in the DE register pair and if the parameter is an integer variable preceded by @ then it is the address of the variable that is passed to the machine code. That allows values to be transferred back to Basic.

The graphics characters in the program listing may be entered most easily by entering and running the short routine at line 6000 first. This copies the Spectrum system of making the keyboard produce the appropriate graphic character when Control is pressed with one of the keys A to U.

The routine at 6040 returns the keys to normal if required. Follow the guidance of the

(continued on page 91)


U.S. GOLD
Premier Arcades
from Datasoft
64
ATARI
The Genuine & Original
Arcade
Favourites
As licensed by leading American Arcade Game manufacturers to
Datasoft®
featuring the original
PAC-MAN
MR. DO!
DIG-DUG
PAC-MAN
CASSETTE
£9·95
DISK
£14·95
THE ULTIMATE IN AMERICAN SOFTWARE FOR YOU ON U.S. GOLD
U.S. Gold is stocked by all leading computer stores including:
Boots
John Menzies
WHSMITH
WILDINGS
WOOLWORTH
Pac-Man® and characters are trademarks of Bally Midway Mfg., Co. ©1980 for the Western Hemisphere: Trademarks of Namco Ltd. ©1980 throughout the rest of the world. Licensed to Datasoft, Inc. by Namco-America, Inc. Dig-Dug™ is designed and engineered by Namco © 1982. Licensed to Datasoft, Inc., by Namco-America, Inc. Mr. Do is a trademark of Universal USA, Inc. ©1984. Datasoft is a registered trademark of Datasoft, Inc. Premier Arcades is a trademark of Datasoft, Inc. ©1984 Datasoft, Inc.
All rights reserved.

(continued from page 39)

Rem statements when typing in the graphics. In addition you may find it easier to enter the machine code if you first enter Key 138,"," to change the decimal point on the numeric pad to a comma.

Finally, since the user graphics do not allow you to make the most of the Amstrad's colour, three different ways of going this have been introduced in the screen construction routine. They may be omitted if preferred since they slow down the screen printing.

To slow down the game increase the value of the pause used at the end of the main loop — set at line 160 — or to make it much easier remove some of the traffic. Every time you get four men home you will find extra spiders added and the speed will increase.

You can avoid the chore of typing in the program by sending £3 with your name and address to Death Race, 12 The Bassetts, Cashes Green, Stroud, Gloucestershire GL5 4SJ. Please make cheques payable to C J Leigh. ■

Listing 1.

```
                 ORIGIN  A400H
0103A4   INITIAL LD BC,COMTAB
210A04           LD HL,BUFFER
CDD1BC           CALL BCD1H         ; tell the system
C9               RET
00000000BUFFER   DEFS 4             ; system work space
1CA4     COMTAB  DEFW NMETAB        ; command table
C347A4           JP PRINT
C378A4           JP LSCROLL
C39CA4           JP RSCROLL
C3BDA4           JP CHR
505249   NMETAB  DEFM PRI           ; command names
4ED4             DEFM N,T+80H
4C534352         DEFM L,S,C,R
4F4CCC           DEFM O,L,L+80H
52534352         DEFM R,S,C,R
4F4CCC           DEFM O,L,L+80H
4348D2           DEFM C,H,R+80H
00               DEFB 0             ; end marker
DD6E00   ADDRESS LD L,(IX+0)        ; calculate screen start
DD23             INC IX
DD23             INC IX
2D               DEC L              ; start at line zero
2600             LD H,0
29               ADD HL,HL          ; multiply by two
29               ADD HL,HL
29               ADD HL,HL
29               ADD HL,HL
E5               PUSH HL
D1               POP DE
29               ADD HL,HL
29               ADD HL,HL
19               ADD HL,DE          ; times eighty
C9               RET
CD33A4   PRINT   CALL ADDRESS
1100F8           LD DE,F800H        ; bottom of first line
19               ADD HL,DE
EB               EX HL,DE           ; source
215000           LD HL,50H          ; move to next line
19               ADD HL,DE
EB               EX HL,DE           ; destination in DE
0E02             LD C,2             ; two lines
E5       HALF    PUSH HL
0604             LD B,4             ; four pixel rows
C5       ROW     PUSH BC
0E02             LD C,2             ; one row becomes two
0650     STRETCH LD B,50H           ; length of line
E5               PUSH HL
D5               PUSH DE
7E       NEXT    LD A,(HL)          ; read byte
12               LD (DE),A          ; write byte
23               INC HL
13               INC DE
10FA             DJNZ NEXT          ; next character
D1               POP DE
7A               LD A,D
D608             SUB 8              ; up a pixel line
57               LD D,A
E1               POP HL             ; recover read start
0D               DEC C
20ED             JRNZ STRETCH       ; do it again
7C               LD A,H
D608             SUB 8
67               LD H,A
C1               POP BC
10E3             DJNZ ROW           ; next read row
D1               POP DE             ; destination = source
0D               DEC C
20DC             JRNZ HALF          ; top half
C9               RET
F5       LSCROLL PUSH AF            ; save parameter count
CD33A4           CALL ADDRESS
1100C0           LD DE,C000H        ; start of top line
19               ADD HL,DE          ; screen address
0608             LD B,8
C5       BACK    PUSH BC
E5               PUSH HL
D1               POP DE
23               INC HL             ; HL to DE
014F00           LD BC,4FH          ; line length less one
1A               LD A,(DE)          ; save first byte
EDB0             LDIR               ; move line
12               LD (DE),A          ; wraparound byte
01B007           LD BC,7B0H
09               ADD HL,BC          ; next pixel row
C1               POP BC
10EE             DJNZ BACK
F1               POP AF
3D               DEC A              ; reduce parameter count
20E0             JRNZ LSCROLL       ; next line?
C9               RET
F5       RSCROLL PUSH AF
CD33A4           CALL ADDRESS
114FC0           LD DE,C04FH        ; end of top line
19               ADD HL,DE
0608             LD B,8
C5       AGAIN   PUSH BC
E5               PUSH HL
D1               POP DE
2B               DEC HL             ; HL to DE
014F00           LD BC,4FH
1A               LD A,(DE)
EDB8             LDDR
12               LD (DE),A
015008           LD BC,850H
09               ADD HL,BC
C1               POP BC
10EE             DJNZ AGAIN
F1               POP AF
3D               DEC A
20E0             JRNZ RSCROLL
C9               RET
D5       CHR     PUSH DE            ; save parameter address
CD60BB           CALL BB60H         ; read screen character
E1               POP HL
77               LD (HL),A          ; put value in variable
C9       END     RET
END A4C3H
```

TELSOFT

A reminder of how to use the Telsoft service.

THE PROGRAMS given here will enable Spectrum and BBC owners to download via *Your Computer's* Telsoft service. First type the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. On the BBC you call the service by entering

CALL &6A00

while Spectrum owners must type

RANDOMIZE USR 60000

So far OE Ltd's Telemod 2 and VTX 5000 modems have been tested with the service, but it also works with a number of other makes.

To find out what is available on Telsoft and how to receive software dial up Colchester (0206) 8068. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bit/s services.

When a program you want to download is available, make sure your modem is set up and dial the number appropriate to your modem's speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select Option 1 from the menu — Receive. After a block of data is received, you will see "OK" printed if there were no errors, otherwise the program will wait for the blocks to come round again.

When the "Program loaded OK" message appears return to the Telsoft menu and select Option 5. You can now save and run the program.

Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 HIMEM=&6A00
20 CLS:PRINT
30 INPUT " START ADDRESS (Hex)";A$
40 A=EVAL("&"+A$)
50 IF A>&6F87 THEN 280
60 IF A<&6A00 OR A>&6FE7 THEN 20
70 PRINT ~A" ";
80 INPUT ":" B$,C$
90 IF LEN(B$) <>16 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X$=MID$(B$,2*N+1,1): GOSUB 300
130 IF E=1 THEN 250
140 X$=MID$(B$,2*N+2,1): GOSUB 300
150 IF E=1 THEN 250
160 B=EVAL("&"+MID$(B$,2*N+1,2))
170 ?A=B:A=A+1:T=T+B
180 NEXT
190 FOR M = 1 TO LEN (C$)
200 X$=MID$(C$,M,1):GOSUB 300
210 IF E =1 THEN A=A-1: GOTO 260
220 NEXT
230 IF T= EVAL("&"+C$) THEN 50
240 PRINT "CHECKSUM ERROR !"
250 A=A-8:GOTO 50
260 PRINT "TYPING ERROR "
270 A=8*(A DIV 8):GOTO 50
280 *SAVE "DOWNLOAD" 6A00 6F87
290 END
300 E=0:IF ASC(X$)<48 THEN E=1:RETURN
310 IF ASC(X$)<58 THEN RETURN
320 IF ASC(X$)<65 THEN E=1:RETURN
330 IF ASC(X$)>71 THEN E=1
340 RETURN
```

Figure 2. BBC.

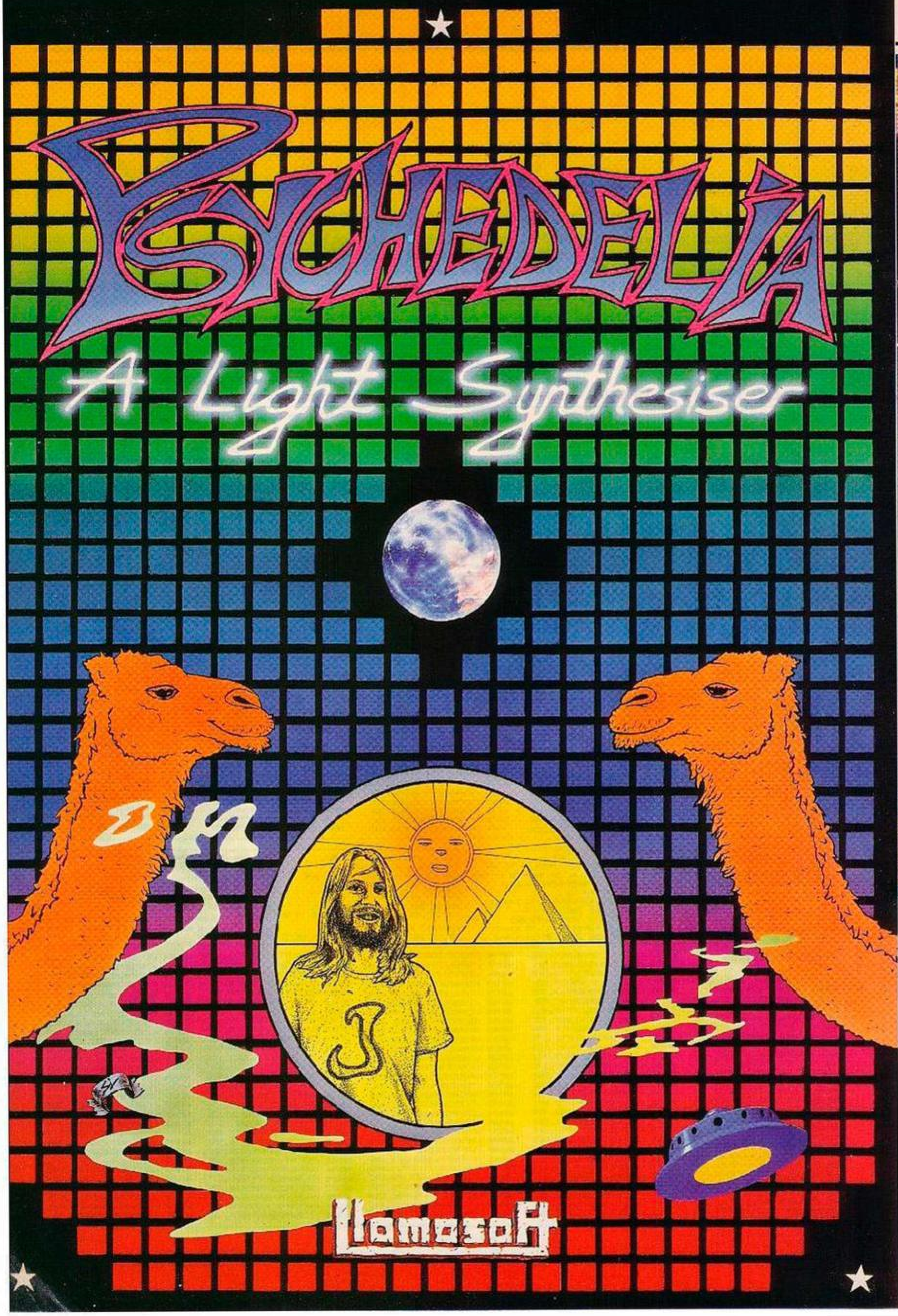
```
6A00 :A9C8A0FEA20120F4,4C6
6A08 :FF20616C20485DC5,38A
6A10 :13F000C934F0E9C5,4C8
6A18 :35F0064C0C6A4C47,280
6A20 :6AA90C20E3FFA9EE,402
6A28 :A000ACFF20F4FFA5,4FB
6A30 :03A20020F4FFA90C,363
6A38 :A20220F4FFA9CBA0,4C8
6A40 :FEA20020F4FF50A5,4DC
6A48 :0C20E3FF20F75BA5,439
6A50 :15A20120F4FFA000,3E9
6A58 :A9FFA09985AF30F6,587
6A60 :A915A20120F4FF20,394
6A68 :0C6C90FB200C5CD0,348
6A70 :F8A0000477847884,41A
6A78 :79047A847B857028,388
6A80 :D56DA57029F0C90E,4B9
6A88 :DBE2200CACB03095,46B
6A90 :7C00CB20056D2005,364
6A98 :D0F0A000A5742900,422
6AA0 :D000DA61C05761DAC,354
6AA8 :1065730577200C6C,289
6AB0 :B0B520E3FFCB2005,524
6AB8 :6BC010D0F0A57320,435
6AC0 :B26D200CACB0A0CE,3CC
6AC8 :7AF000A95820E3FF,478
6AD0 :20E7FF4C676A200C,34F
6AD8 :6CD00CC57DF00BA5,48C
6AE0 :5820E3FF20E7FF4C,4AC
6AE8 :676AD03A0BB9D56F,43E
6AF0 :D00E20E7FFA90020,380
6AF8 :E3FF4CB3604C676A,469
6B00 :A000847A847B200C,2C9
6B08 :AC80F2917620D56D,477
6B10 :CDC47650F120006C,45A
6B18 :B0E3C57AF00DA950,4CE
6B20 :20E3FF20E7FF4C67,4BD
6B28 :6A200C6CB0CFC57B,3C1
6B30 :F000A95820E3FF4C,447
6B38 :676A20C76E20E7FF,429
6B40 :A573A0A90099B56F,3F6
6B48 :A50AC98200582D07,419
6B50 :6B49C020556CA955,3B8
6B58 :20306EA95820556C,298
6B60 :A915A20120F4FF20,394
6B68 :F76BA471C00B8985,385
6B70 :6F1051900DF7A90C,3A4
6B78 :20E3FF20A56DA95A,337
6B80 :05E2A96F0583A907,3D7
6B88 :20006E20F06D20A8,2DB
6B90 :6DF90520006EA9B8,2DA
6B98 :20E3FF20F06DA9D2,302
6BA0 :2060FF4C0C6AA955,3BF
6BA8 :20306EA99620556C,2DE
6BB0 :4C6A6BA475200C6C,2D2
6BB8 :B8C0FA200C6C200C,316
6BC0 :6C4C486B4C6C6AA9,336
6BC8 :2020E3FFA96F20E3,43D
6BD0 :FF796B20E3FF6BA9,51E
6BD8 :9CA000A6DAE002D0,41E
6BE0 :00F21320F4FFA212,3B7
6BE8 :20F4FF60AC9720F4,4C0
6BF0 :FFF29620F4FF60A9,553
6BF8 :9CA000A6DAE002D0,41E
6C00 :EBF25320F4FFA957,3F7
6C08 :20F4FF6018A99A05,34F
6C10 :0F047EA991420020,38D
6C18 :F4FFB009C087D005,440
6C20 :60604C0CA0947E20,2D4
6C28 :476CC60F00021B60,373
6C30 :A50AC90200062075,367
6C38 :6EB0EC60A9913201,447
6C40 :20F4FF90A47E30DF,55C
6C48 :60DA02D2CAEBCAD0,5AA
6C50 :F0AA60A900847EAE,458
6C58 :20496C0000FAA47E,449
6C60 :6BA9FBA000A2FF20,452
6C68 :F4FFA90085BAA90C,468
6C70 :20E3FF20A06DA984,3E4
6C78 :20006AA989B582A5,2F8
6C80 :6F0585A00020F06C,39C
6C88 :281560C941F000C5,378
6C90 :42F011C943F0174C,3A2
6C98 :6C6CA9A0A20120F4,335
6CA0 :FF4CB76CA900A203,3C4
6CA8 :20F4FF4CB76CA900,433
6CB0 :A20420F4FFE68AA5,4CE
6CB8 :7C20E3FFA47E20A0,468
6CC0 :6DA9032000AF70F0,2C4
6CC8 :6DA01720156DC941,200
6CD0 :F00DC942F011C943,413
6CD8 :F0174C616CA987A2,372
6CE0 :[illegible]
6CE8 :07A20520F4FF1C05,314
6CF0 :6DA907A20420F4FF,3D6
6CF8 :E60AA50AC902D005,443
6D00 :A9E6A000A20120F4,3C8
6D08 :FFA90D20E3FF2053,495
6D10 :6C20536C60204B6C,2E3
6D18 :A90520006E20F06D,2CE
6D20 :20AB60A9052000AF,274
6D28 :20FB6D20AB6DA905,368
6D30 :20006E20FB6D20AB,2DE
6D38 :6D047EA90320006E,2A9
6D40 :A9D22AF0FF051C60,408
6D48 :A90C20E3FF20AE6D,3EF
6D50 :A90720006EA9990B,306
6D58 :82A9AE8583A00020,361
6D60 :F06D20A06D20956D,3C0
6D68 :20996D20995D20AB,317
6D70 :[illegible]
6D78 :6D20AB6DA9822000,270
6D80 :6E20FB6D20AB6E20,348
6D88 :E7FFA98220E0FF48,548
6D90 :A90FA20020F4FF68,3D5
6D98 :6DA90020006E20F0,287
6DA0 :6D20AB6D6020A060,33A
6DA8 :20AB6D20E7FF20E7,445
6DB0 :FF604829F06A6A6A,3FE
6DB8 :6A0730C73A300310,1F1
6DC0 :690720E3FF68290F,312
6DC8 :0930C93A30031869,1F0
6DD0 :0720E3FF60A57B85,3AE
6DD8 :[illegible]
6DE0 :A57B4900857BA57A,390
6DE8 :4910857A267A267B,299
6DF0 :CAD0EB6020E3FFC8,3AC
6DF8 :B182C90DD0F6C860,4E7
6E00 :B670AA92020E3FF,470
6E08 :CAD0FAA67060C97F,55F
6E10 :D002A98620F4FFE0,4FD
6E18 :00F012A97FC920D0,3C3
6E20 :0EC90AF00AC900F0,3A1
6E28 :06C907F002A90060,2D1
6E30 :057C067D047EA991,440
6E38 :A20120F4FFA903A2,404
6E40 :0720F4FFA97AA200,403
6E48 :20F4FF902902F0F4,40A
6E50 :A47CA997A20920F4,41F
6E58 :FFA903A20420F4FF,464
6E60 :A991A20020F4FFB0,49F
6E68 :09C0070005636B4C,2C1
6E70 :0C6AA27CA679047E,39C
6E78 :60047EB67DA979A2,446
6E80 :0020F4FF902701F0,3CD
6E88 :00A97AA20920F4FF,400
6E90 :[illegible]
6E98 :7E60444F574E4C4F,2B1
6EA0 :4144494E47204D45,215
6EA8 :4E550D3120202052,193
6EB0 :4543454956450D34,1F2
6EB8 :2020205345542042,1AE
6EC0 :6175642052617465,2E6
6EC8 :0D35202020455849,188
6ED0 :5420544F20424153,20D
6ED8 :[illegible],227
6EE0 :204E535440424552,1F6
6EE8 :2020355345204354,1EC
6EF0 :574C2D4720514F20,1F5
6EF8 :524554555 24E2054,254
6F00 :4F204D454E552029,1ED
6F08 :0D53455420545241,200
6F10 :4E534D4954204261,24E
6F18 :756420526174650D,292
6F20 :4120202020373520,14F
6F28 :6175640D42202033,1FC
6F30 :303020426175640D,209
6F38 :4320313230302042,188
6F40 :6175640D03400420,253
6F48 :5245434549564520,223
6F50 :4261756420526174,2C3
6F58 :650D50524F475241,23D
6F60 :4D20204C4F414445,1F2
6F68 :4420204F4B0D5052,200
6F70 :4553532041 4E5920,213
6F78 :4B45592046 4F5220,210
6F80 :4D454E550D202020,1A2
```

Figure 1. Spectrum.

```
5 REM SPECTRUM 48K          fig 1
10 REM Hex Code Loader
15 CLEAR 59000
20 POKE 23658,8: CLS : PRINT
30 INPUT "Start Address ";a
50 IF a>61135 THEN GO TO 280
60 IF a<60000 THEN GO TO 30
70 PRINT a;
80 INPUT " :";b$
85 IF b$="END" THEN GO TO 280
90 IF LEN b$<>20 THEN GO TO 260
100 LET t=a-256*INT (a/256)
110 FOR n=0 TO 7
120 LET x$=b$(2*n+1 TO 2*n+1)
125 GO SUB 300: LET y=x
130 IF e=1 THEN GO TO 260
140 LET x$=b$(2*n+2 TO 2*n+2)
145 GO SUB 300: LET y=y*16+x
150 IF e=1 THEN GO TO 260
170 POKE a,y: LET a=a+1
180 LET t=t+y: NEXT n: LET y=0
190 FOR m=1 TO 3
200 LET x$=b$(17+m TO 17+m)
205 GO SUB 300: LET y=y*16+x
210 IF e=1 THEN LET a=a-8: GO TO 260
220 NEXT m
230 IF t=y THEN PRINT ":";b$: GO TO 50
240 PRINT "Checksum Error"
250 LET a=a-8: GO TO 50
260 PRINT "Typing Error"
270 LET a=8*INT (a/8): GO TO 50
280 SAVE "download"CODE 60000,1136
290 POKE 23658,0: STOP
300 LET e=0: LET x=CODE x$-48-7*(x$>"9")
310 IF x<0 OR x>15 THEN LET e=1
320 RETURN
```

Figure 2. Spectrum.

```
60000 :CD15EDC307ECCD15,4C7
60008 :ED2D3A6CCD66CDCD,631
60016 :50EDCB47EE30F8CD,54F
60024 :BBEDFE31CA99EAFE,69C
60032 :35CAB7EAC366EACD,500
60040 :15ED3EFACDB4FDCD,5FF
60048 :15EDC9CD15EDC366,553
60056 :EACD66ED11E5EE06,50C
60064 :B05EFF121310FCCD,45E
60072 :15EE11CDE5061736,302
60080 :20121310F3CD1FED,3DF
60088 :30F0CD50EDCD1FED,5BE
60096 :38F03265EF3E0032,3E9
60104 :6CEF326FEF3270EF,544
60112 :3A63EFCDE8EC3A65,5A1
60120 :EFEAF0FE0020EE0E,627
60128 :091165EFC31FEDDA,501
60136 :AAEA1312C3E8FCD0,552
60144 :20F23C69E7E6C020,51A
60152 :0D214E5C3A68EF0E,36C
60160 :0047052263EF0000,1DA
60168 :11CDEECD1FED209A,47F
60176 :12130CCDE8EC79FE,45C
60184 :1020F03A68EFCDB1,447
60192 :ECCD1FEDDAAAEA21,574
60200 :6FEFBE20133E5811,324
60208 :E0EE12133E0012CD,340
60216 :D7ECCDA6ECC3AAEA,681
60224 :CD1FEDDAAAEA2170,518
60232 :EFBE20E121E5EE3A,524
60240 :6BEFA56F3E000C67,3CC
60248 :3E00BE200BCDD7EC,40F
60256 :3E2132005CC3FFEB,482
60264 :3E00326FEF3270EF,3C7
60272 :CD5EECDEF060CD1F,49C
60280 :EDDAAAEA3273EFCD,634
60288 :EBEC3A68EFFE0020,5B6
60296 :053A69EFE6003A73,432
60304 :EF12130C3A6AEF99,3FC
60312 :20DCCD1FEDDAAAEA,5D8
60320 :216FEF0EC22DEBCD,5B4
60328 :1FEDDAAAEA2170EF,5A2
60336 :BEC22DEB3E6F32E2,509
60344 :EE3E6032E3EE3E00,490
60352 :32E4EE3A005CFE21,501
60360 :2003CD15EECDD7EC,553
60368 :CDA6EC21E5EE3A68,5C5
60376 :EF856F3E008C6736,422
60384 :0021E5EEED4B66EF,561
60392 :0C7EFE00C20DEA23,4FC
60400 :0D20F63EFACDB4ED,5B9
60408 :1F01D7FEC366EACD,5E0
60416 :1FED30F8C3B0EAF3,594
60424 :0603AFD3FF10FB3E,308
60432 :40D3FF3EFFD3FF3E,56F
60440 :31D3FF3E0F320F5C,385
60448 :32085C32485C3E01,250
60456 :D3FE21915CCB9EFB,5EB
60464 :C350EDC366EACD15,52F
60472 :ECCDA6ED3E01D3FE,556
60480 :2165EE3E00CD0FEC,442
60488 :C304ECCDA3ECCDA6,654
60496 :EC23CD77ECCD77EC,58F
60504 :C3A0ECCD04ECCDA6,661
60512 :EC233E0DCD0FECCD,40F
60520 :B4EC23CDA3EC3E03,498
60528 :CD0FECCD04ECC9CD,680
60536 :A3ECFE07C0AFFECD,561
60544 :B4EC23C97EFE00C8,520
60552 :CD08ED23C3B4ECFE,651
60560 :0DC0F53E20CD08ED,52D
60568 :F13DC30FECCDA0EC,65D
60576 :CDA3ECCDA6EC3E00,5A6
60584 :CD08ED3EFF320C5C,574
60592 :C9F513E6F0CB1FCB,68C
60600 :1FCB1FCB1FF630FE,4CF
60608 :3A0A66CC607121[illegible],498
60616 :F1E60FF630FE3AFA,606
60624 :B4ECC607213C921,46C
60632 :CDEEE5CDB4ECE106,69C
60640 :173E20772310FC3E,337
60648 :0077C9E52170EFAE,538
60656 :77C5AE087EA7CB17,449
60664 :38007EEE08773A6F,3C9
60672 :EFEE10326FEF3721,3D5
60680 :6FEFCB1623CB1600,350
60688 :20E2C1E1C9110501,394
60696 :216A00CDB503C93E,32F
60704 :963270EFCD47ED0A,529
60712 :2EEDF1C366EACDAC,5C0
60720 :ED78E601F602D3FE,548
60728 :AF2177EF35200237,2FC
60736 :C9CD77CD30E0C9C0,6F0
60744 :47EED0FECEC037C9,5E6
60752 :F5C0FF3A01EFFE00,5C7
60760 :20043E3610023F37,187
60768 :D3FED87EE1C9F53A,475
60776 :81EFFE0020043E36,376
60784 :D3FFCD50EDF1C93E,644
60792 :00D0FFE60037C8D0,59[illegible]
60800 :FFFA0237C0D0AFFA,67A
60808 :302004087FA7C93A,3E0
60816 :81EFFE0020043E37,397
60824 :10023E36D3FFD07F,452
60832 :C9CD47ED3A73EFD0,5DE
60840 :F1C366EAF53ED23D,5EE
60848 :20FDF1C9CDACED3D,62A
60856 :20FAC9C5D5E5F5FE,70D
60864 :7F2B13CDF9E0FE0C,537
60872 :200CFE0D20053E20,280
60880 :D73E0DD718103E20,34F
60888 :D73E08D73A085CFE,4E0
60896 :2120033E0ED73E5F,2E6
60904 :D73E08D7F1E1D1C1,640
60912 :C9FE072E1CFECB28,4F3
60920 :19FE0C2014FE0828,3B0
60928 :10FE0D280CFE20FA,367
60936 :0FEEFE80FA11EE3E,40A
60944 :00C93E07C9C0680D,32C
60952 :3E02CD01163E1832,1C4
60960 :895CC93E121601CD,302
60968 :1122C93E121600CD,257
60976 :1122C9C5D5E53E02,3EB
60984 :CD0116CD47EE30FB,451
60992 :CD5CEEE1D1C1C93A,5CD
61000 :2D8CCDC7200C3A0D,20F
61008 :5CF5213B5CCBAEF1,4C3
61016 :A7C937C9F5111000,3DE
61024 :CD18EDF1C9444F57,4D6
61032 :4E4C4F414449 4E47,2B4
61040 :204D454E55003120,216
61048 :2020524543454956,276
61056 :4500352020204578,217
61064 :697420746F204261,32B
61072 :7369630020205573,20F
61080 :652053796D626F6C,393
61088 :2053686966742D20,30B
61096 :204700746F205265,2C9
61104 :7475726E20746F20,39C
61112 :4D454E5520290045,27B
61120 :4E544552204E554D,309
61128 :4245522000000000,1C1
```


PSYCHEDELIA
A Light Synthesiser
Llamasoft

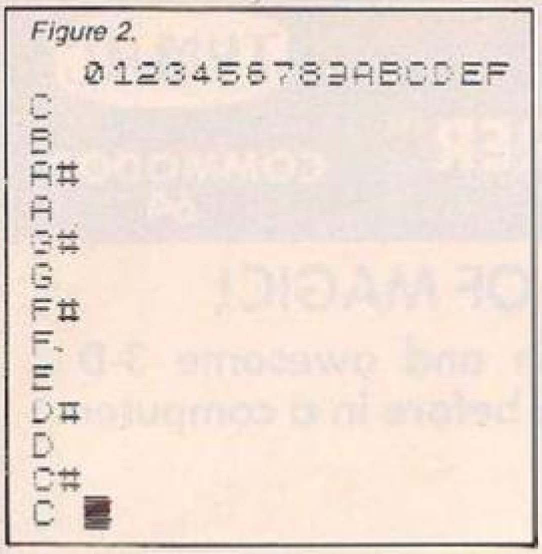


Figure 2.

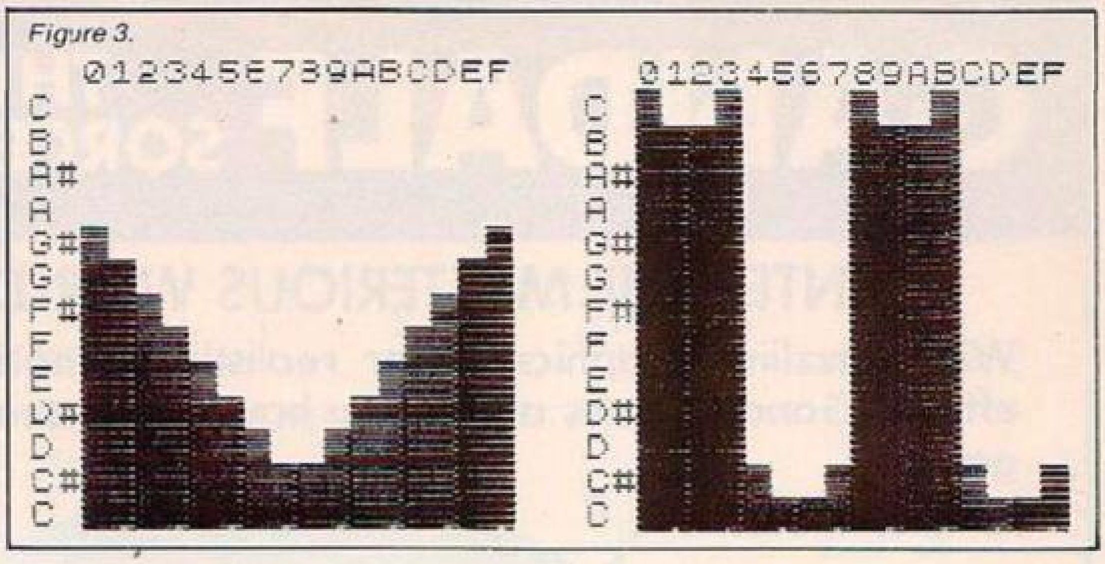


Figure 3.

SYNSOUNDS

Tim Closs provides a useful facility on a machine not noted for its sound potential — the Spectrum.

THIS PROGRAM converts the 48K Sinclair ZX Spectrum into a versatile electronic keyboard. Up to 100 different sound effects can be synthesised by the user, any 10 of which can be accessed instantly while playing a piece of music. In addition, seven riffs can be stored in the memory and incorporated into the performance at the touch of a key.

Facilities on a main menu

All the facilities offered are obtainable from a main menu displayed at the start of the program:

- Play.
- Synthesise sound effects.
- Assign sound effects.
- Compose riffs.

Play: When this option is selected the screen is cleared and the computer keyboard is arranged as in figure 1. The labelled keys in the middle two rows are set out like a piano and can be played in a similar manner. However, three octaves are available since pressing Octave Down will lower all notes by one octave and Octave up will raise them. Hours of fun can be had from this basic electronic keyboard, even if your musical talent is strictly limited. But there's much more to come.

Synthesise sound effects: The essence of a synthesiser is to alter the kind of sound produced without altering the musical pitch of the notes themselves. On the Spectrum this can be achieved by causing a rapid change of frequency as the note is played: the particular "frequency waveform" governs the character of the sound emitted. In this program the user is able to invent as many as 100 unique frequency waveforms as follows.

On choosing menu option 2 you are first required to enter the number of the sound effect you are about to synthesise. This should be within the range 0-99. Having done this two axes will appear on the screen — see figure 2. The horizontal time axis covers the duration of the note, and is divided into 16 sectors, while the vertical axis represents frequency.

Beep returns you to menu

To draw out your frequency waveform keys 6 and 7 are used to move a bar up and down each sector and key 0 enters the desired level

(continued on page 97)

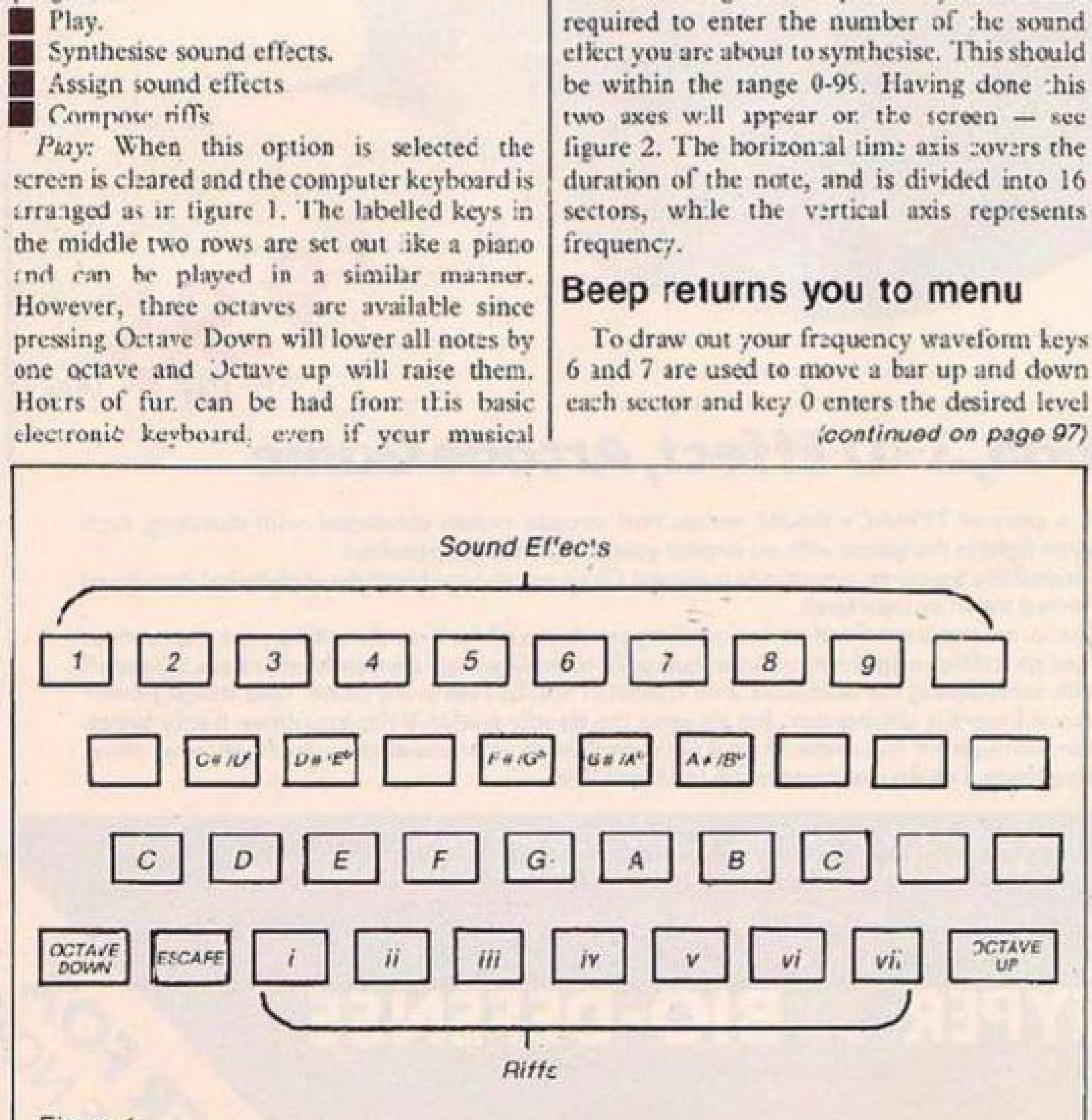


Figure 1.

Code 1.

```
31965: 210050060D7E23DB = 560
31973: FEA628042310F6C9 = 962
31981: 3E7FDBFEE6012811 = 950
31989: 3EFED8FEE6012810 = 1076
31997: 5E060C1C10FD4318 = 494
32005: 075806181C10F043 = 489
32013: 0E482AFEFF0510AF = 825
32021: 5ED54EB92800C541 = 879
32029: 1C10FDC13E32BBDC = 1009
32037: 4E7DC5CB23CB23E5 = 1099
32045: 211A804B0603ED4A = 579
32053: 5E23562346234E68 = 537
32061: 61CDB503E1C1D123 = 1148
32069: 10CFC91E30C90000 = 703
32077: 0200021E48D0060A = 405
32085: 7E23D8FEF6230523 = 880
32093: 10F6181205CB2068 = 648
32101: 2E0001F830ED4A5E = 820
32109: 2356ED53FEFF2170 = 1095
32117: 8706077E23DBFEA6 = 948
32125: 28042310F6C905CE = 750
32133: 20CB20CB20CB2016 = 809
32141: 0E00217EE7ED4A05 = 617
32149: 103EFF8EC84EE5C5 = 1227
32157: CD0F7DC1E12310F1 = 1055
32165: C900 = 201
```

Code 2.

```
32768: BF04BF08DF08BF10 = 832
32776: DF10FD10FB10FD08 = 1036
32784: FD04FB04FD02FB02 = 1020
32792: FD010100F20C0100 = 510
32800: 360C0200650B0200 = 214
32808: DE0A0200400A0200 = 310
32816: AB0902001F090200 = 224
32824: 9A0802001D080200 = 203
32832: A607020036070300 = 239
32840: CE060300CA060300 = 330
32848: 0C060300B4050300 = 209
32856: 6005030011050400 = 130
32864: C704040080040400 = 343
32872: 3E040400FF030500 = 333
32880: C40305008C030500 = 352
32888: 5803050026030600 = 143
32896: F7020600CB020600 = 466
32904: A10207007A020700 = 301
32912: 5402080031020800 = 153
32920: 10020900F1010900 = 278
32928: D3010A00B7010A00 = 416
32936: 9C010B0084010C00 = 314
32944: 6C010C0056010D00 = 221
32952: 41010E002E010F00 = 142
32960: 16010F000A011000 = 70
32968: F9001100E9001200 = 517
32976: DA001300CD001500 = 463
32984: BF001600B3000000 = 392
32992: 00000000EF02EF04 = 484
33000: EF08EF10F710F708 = 1020
33008: F704F702F701EF01 = 988
33016: 40810031 = 370
```

Code 3.

```
34672: 7F027F047F087F10 = 538
34680: FE10FE08FE040102 = 793
34688: 0304 = 7
```

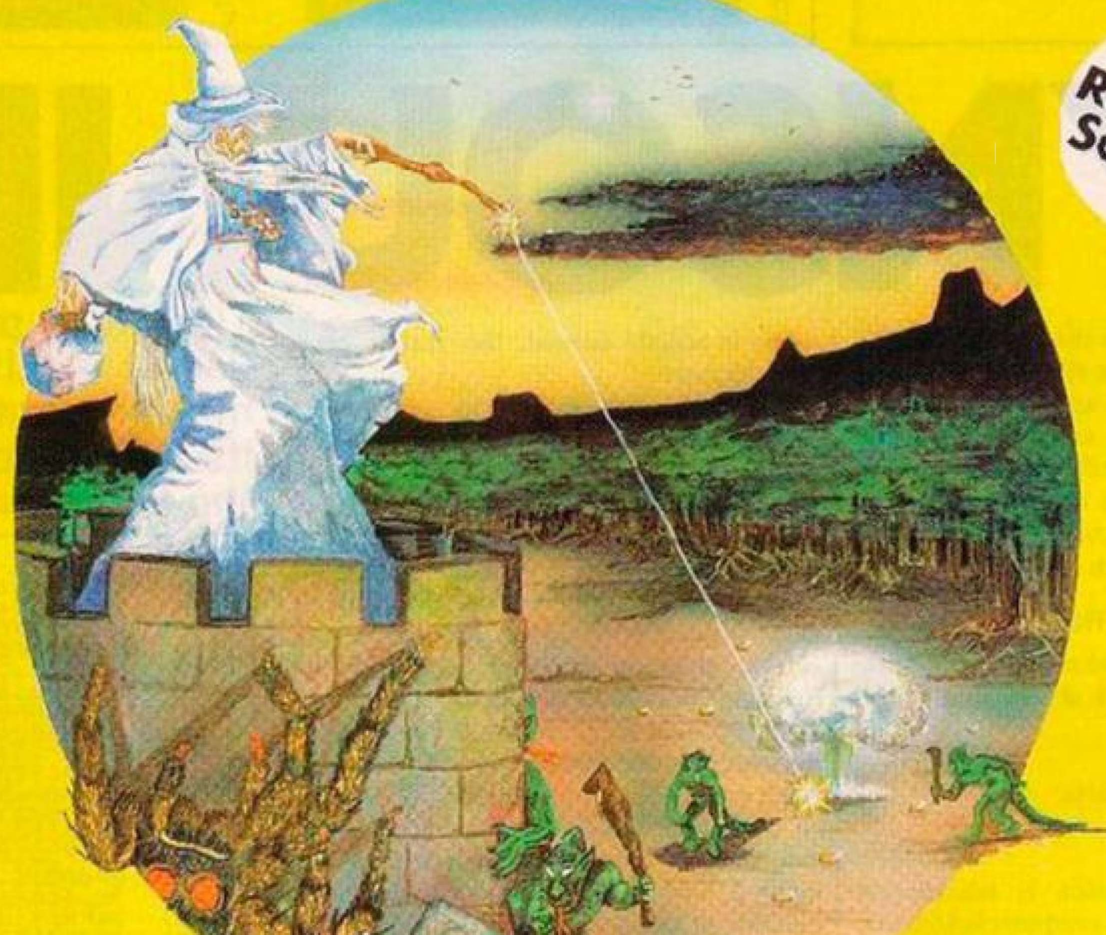
GANDALF THE SORCERER™

TYMAC®

COMMODORE 64™

ENTER THE MYSTERIOUS WORLD OF MAGIC!

With dazzling graphics, super realistic animation and awesome 3-D effects. Gandalf gives action you have never seen before in a computer game.



Realistic Sound!

£14.95 DISK INC. VAT

£9.95 INC. VAT TAPE

A Super Action, 3-D Effect, Arcade Game

Gandalf, a one-player, 3-D simulation is part of TYMAC's GAME series. Fast arcade action combined with dazzling, high resolution graphics and sound effects puts you right in the game with an impact you never thought possible!

A man's home is his castle, but to you, Gandalf the Sorcerer, your castle is sacred. Or so you thought until the scalytailed lizardmen took a fancy to your treasure which is protected by an ancient spell.

Your castle is under seige. From the distant forest come waves of attacking slimy creatures, all bent on abducting your apprentices and holding them for ransom. If the lizardmen get all three apprentices, you must yeild to their greedy demands and release the spell on your treasure. You cast your power bolts, annihilating the attackers with a blast of fire, but still more come. Your magic power drains and you climb the tower to draw more from the shining star. But beware the deadly spider. If the lizardmen finally break down the castle door, you must battle them throughout the castle. And if they do kidnap your assistants, you must chase them through the woods before the creatures drag them, kicking and screaming, to Lizard Lair.

AVAILABLE FROM: BOOTS, W. H. SMITHS, H. M. V. RECORD SHOPS
ALL GOOD SOFTWARE DEALERS AND ALL OTHER LEADING SOFTWARE DISTRIBUTORS

WATCH FOR FORTHCOMING RELEASES
INCLUDING

TYPE-SNYPER™ AND BIO-DEFENSE™

SPECTRUM VERSIONS AVAILABLE SOON

TRADE DISTRIBUTOR ENQUIRIES INVITED!

TO ORDER BY MAIL (P & P FREE) SEND CHEQUES OR POSTAL ORDERS TO:-
TYMAC (UK) LTD 43-48 NEW STREET BIRMINGHAM 021-643 8899

FLYER FOX AVAILABLE NOW!!!

Listing 1.

```
   5 LOAD ""CODE : LOAD ""CODE :
 POKE 65535,129: POKE 65534,48:
GO TO 100
   6 POKE 23658,8
 100 CLS : PRINT "****SYNSOUNDS*
***BY T.CLOSS****
               ***********MA
IN MENU**********"
 110 PRINT : PRINT "(1) PLAY": P
RINT : PRINT "(2) ASSIGN FUNCTIO
N KEYS": PRINT : PRINT "(3) DEFI
NE SOUNDS": PRINT : PRINT "(4) D
EFINE PROGRAMS"
 120 IF INKEY$="1" THEN GO TO 20
0
 130 IF INKEY$="2" THEN GO TO 40
0
 140 IF INKEY$="3" THEN GO TO 60
0
 145 IF INKEY$="4" THEN GO TO 80
0
 150 GO TO 120
 200 CLS
 210 LET A=USR 31965: LET A=USR
32060: IF INKEY$="Z" THEN GO TO
100
 220 GO TO 210
 400 INPUT "FUNCTION KEY ? (1 TO
 10) ";K
 405 IF K=10 THEN LET K=0
 410 INPUT "SOUND NO. ? (0 TO 99
) ";E
 420 LET H=33072+(E*16)
 430 POKE 33016+(K*2)+1,INT (H/2
56): POKE 33016+(K*2),H-((INT (H
/256))*256)
 440 GO TO 100
 600 CLS : INPUT "SOUND NO. ? (0
 TO 99) ";N
 610 LET H=N*16+33072
 620 CLS
 625 FOR G=9 TO 21: READ S$: PRI
NT AT G,0;S$: NEXT G
 626 DATA "C","B","A#","A","G#",
"G","F#","F","E","D#","D","C#","
C"
 627 RESTORE
 628 PRINT AT 8,2;"0123456789ABC
DEF"
 630 FOR X=0 TO 15
 640 LET Y=21
 650 PRINT AT Y,X-2;"■"
 655 PAUSE 0
 660 IF INKEY$="6" AND Y<21 THEN
 PRINT AT Y,X+2;" ": LET Y=Y+1:
GO TO 650
 670 IF INKEY$="7" AND Y>9 THEN
LET Y=Y-1: GO TO 650
 680 IF INKEY$="0" THEN POKE H+X
,(21-Y)+12: GO TO 689
 685 GO TO 650
 689 NEXT X
 690 BEEP .5,10
 700 GO TO 100
 800 CLS : INPUT "PROGRAM NO. ?
(0 TO 6) ";P
 803 PRINT AT 4,0;" PROGRAM LENG
TH - 0 TO 15 NOTES"
 804 PRINT AT 7,0;"  LOW    MIDDL
E   HIGH"
 805 FOR G=9 TO 21: READ S$: PRI
NT AT G,0;S$;AT G,8;S$;AT G,16;S
$;AT G,4;(21-G);AT G,12;(21-G)+1
2;AT G,20;(21-G)+24;: NEXT G
 806 RESTORE
 807 PRINT AT 15,23; INVERSE 1;"
TYPE 255 ";AT 16,23;"TO     END"
 810 LET H=P*15+34686
 820 FOR G=H TO H+15
 825 INPUT O: IF O<0 OR (O>36 AN
D O<>255) THEN BEEP .05,20: GO T
O 825
 826 IF O=255 THEN POKE G,0: GO
TO 100
 830 POKE G,O: NEXT G
 840 GO TO 100
```

(continued from page 95)

when it is reached. After levels in all 16 sectors have been defined in this way, a short beep returns you to the main menu.

Some examples of waveforms are depicted in figure 3, but you will obviously want to experiment with your own ideas.

Assign sound effects: From your bank of frequency waveforms produced in menu option 2 any 10 can be chosen for instant recall at the touch of a button. Simply type in a number from 1-10, followed by the number of the waveforms. When you now play the piano keyboard, each note will take on the "flavour" of the sound effect chosen. Pressing another of the keys 1-10 will change to a new sound effect without interrupting the flow of music.

Play sequence of notes

Compose riffs: It is often necessary to play a short riff — sequence of notes — which is repeated many times and may be complicated or fast. Synsounds allows up to seven riffs to be stored simultaneously and then replayed by pressing a single key. It is thus possible to give a creditable musical performance with a minimum of stamina and skill. On the computer keyboard in figure 1 the keys labelled (i) to (vii) in the bottom row refer to these pre-programmed riffs.

After entering the number of the riffs you wish to compose (0-6), the Spectrum will draw up a chart of all the notes playable — three octaves. Each note has a number 0-36 — 0 for the lowest C and 36 for the highest, and it is this number that you must enter to place the desired note in the memory. Up to 16 notes can be entered in a single program, but if less than this number are required then typing 255 will complete the riff and return you to the main menu.

Longer notes can be entered by repeating the note several times.

Listing 2.

```
   5 REM  spectrum hex loader
  10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2
)-48-(7 AND h$(2)>"9")
  20 INPUT "start ";s
  30 INPUT "finish ";f
  40 FOR n=s TO f STEP 8
  50 LET tot=0
  60 PRINT n;" ";
  70 INPUT h$: PRINT h$;
  80 FOR b=1 TO LEN h$ STEP 2
  90 LET z=FN h(h$): LET tot=tot
+z
 100 POKE n+b,z
 110 LET h$=h$(3 TO )
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
 error - try again": GO TO 50
 150 NEXT n
 160 REM Enter STOP to stop
```

Note that the riff will be played in the current waveform, so the 'flavour' of the riff can be altered by pressing any of the keys 1-10.

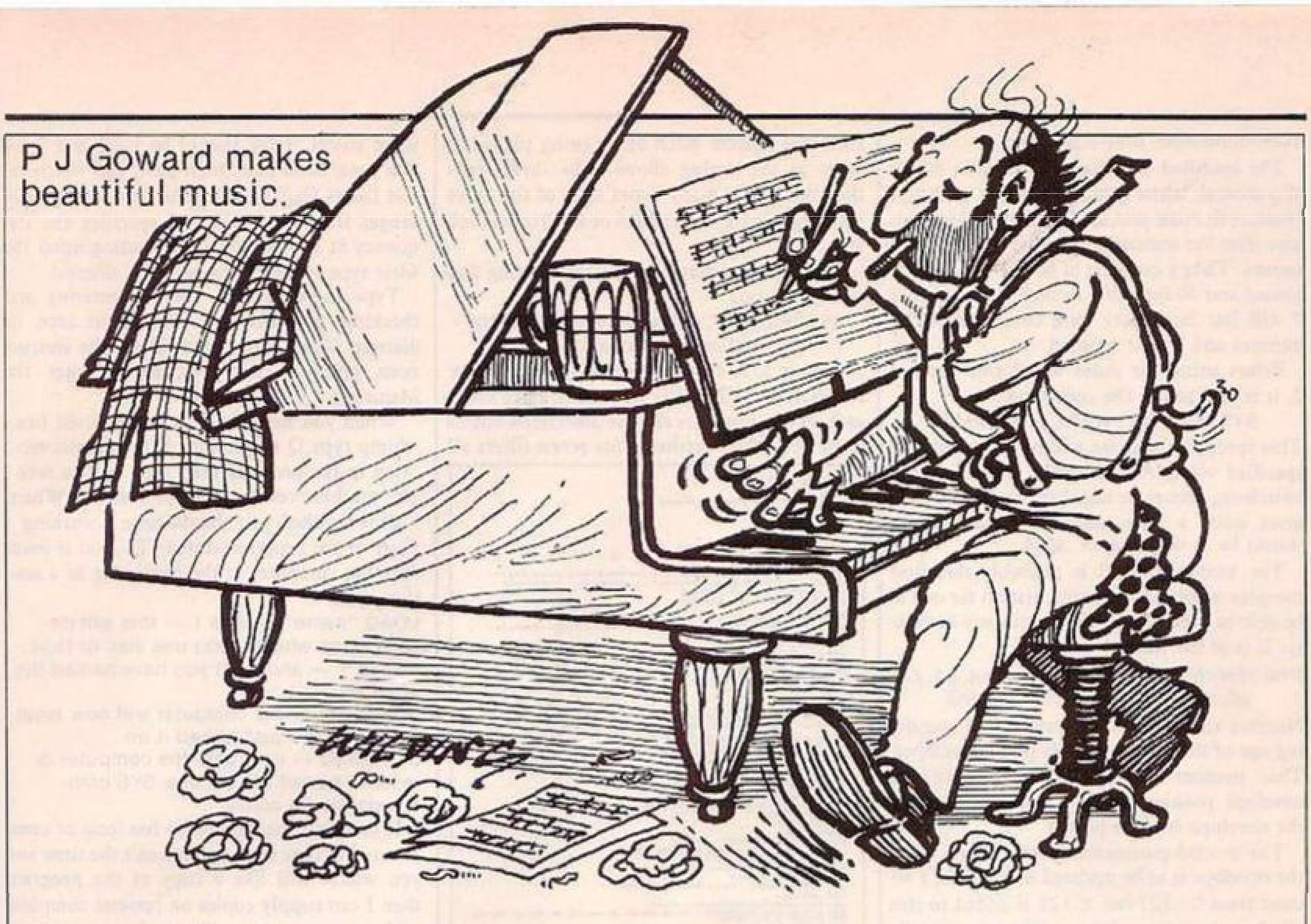
Sound produced only by the Spectrum's internal speaker will rarely be of sufficient volume, so amplification can be achieved by connecting the mic socket on the tape recorder to the mic socket on the Spectrum and push down the record button on the recorder.

Entering synsounds

To enter Synsounds, I advise the following method:

1. Enter the Basic program from listing 1. Save it by typing: SAVE "SYNSOUNDS" LINE 5.
2. NEW the program.
3. Type in the Basic program from listing 2. Type in Run.
4. Enter the code from listing 3-work from left to right and from up to down.
5. Save the code directly after the first Basic program by typing:
SAVE "CODE 1" CODE 31965,204: SAVE "CODE 2 + 3" CODE 32768,1922.
6. New the program.
7. Load the finished program by rewinding the tape and typing: LOAD "SYNSOUNDS".

P J Goward makes beautiful music.



CBM COMPOSER

HAVE YOU EVER tried to make a sound using the Commodore 64? If you have then you will obviously have experienced much of the frustration caused by the bewildering array of Poke commands required to activate its powerful SID chip. Even making a feeble beep is no simple matter, requiring a minimum of four pokes, that is, of course, if you can underatand the poor documentation provided with the machine.

If you are one of the many people that have parted with the £50 required for Simon's Basic then you will have no doubt been disappointed with the very poor sound commands which will only allow music to be played in one voice. However, for the rest of the Basic I have few complaints.

All sounds have one main command to activate them, to relieve complications that could otherwise arise, and also, since all sound generation is controlled by microprocessor interrupts, basic programs will still continue to be executed while the sound is played. Facilities are provided for harmonies to be played in all three voices, and each voice allows four notes to be buffered and subsequently played.

Thus a duration must be specified for each note eliminating the time delays required by some computers for their sound. The commands allow for all of the musical waveforms and modulations of the chip to be used as well as the programmable filter. The width of the pulse waves generated by each voice may also be programmed.

All of the commands are of the form of an extended SYS statement, here 380Z users will notice a similarity with RML's Call command. The routine works by redirecting every SYS statement just before it is encountered by the basic interpreter, and then, if it is of the form of an extended statement, it redirects the SYS call to the appropriate sub-routine.

A simple example is

SYS "VOLUME", 15

which sets the total output volume for all three voices, it's parameter should bein the range 0 . . 15 where 0 is silence and 15 is maximum volume, any value given that is greater than 15 or negative will be scaled into the correct range. After setting the volume, and before any notes may be played on a particular voice, a SYS "ADSR" must be made. This is of the form:

SYS "ADSR", voice, attack, decay, sustain, release

and determines the volume envelope for any note following on the specified voice.

Voice should be in the range 1 . . . 3, a larger value will be scaled into this range but a zero will give an error. Attack specifies the rate at which the sound reaches it's maximum volume, while decay governs the rate at which the note decreases in volume after its attack sequence sustain specifies the volume level at which the note is then maintained, and finally release governs the rate at which the note falls to zero volume after its duration has ended.

Thus

SYS "ADSR",1,0,9,0,0

will set for voice 1 the familiar harpsichord — type envelope, while

SYS "ADSR",1,0,0,15,0

will set for voice 1 an envelope which instantly reaches its maximum volume and when the note has finished it will instantly decay to zero volume. Each of the final 4 ADSR parameters should be in the range 0 . . . 15.

Once a voice has had its ADSR envelope set any number of sounds may be played on that voice with the command:

SYS "SOUND", voice, wave, envelope, frequency, duration

Voice may take the values 1. .3, 5. .6, 9. .11, 13. .15. 1. .3 do, as you might expect, just play on that specified channel. Five and 6 work for voices 1 and 2 respectively, and allow synchronisation of two notes on these channels.

Thus after a channel of five has been specified this note will not be played until a command to channel 6 has been executed and then these two notes will be played together. Channels 9. . 11 have a similar function but synchronise three-note chords together on all three channels, 13. . 15, before they play the note specified, flush the sound buffer for their respective voices, 1, 2 and 3, and the note will be played disregarding any previous note on that channel. Wave sets the sound wave to be used: 0. .3 are triangle, sawtooth, pulse, and noise waveforms.

The envelope parameter may take the values 0. .3, 0 specifies a pure note while 1. .3 are reserved for the pitch envelopes — see "envelope" command. Pitch may be varied in the range 0. .55535 in increasing frequency.

(continued on next page)

(continued from previous page)

The specified duration should be in 60th's of a second, when using alternative interrupt routines to those provided by the machine this may alter but normally it will be in 60th's of a second. Thus a duration of 60 will last for one second and 40 for half a second. A duration of 0 will last for a very long time: approx 18 minutes and is best avoided.

Before using the pulse waveform, number 2, it is best to use the command:

SYS "WIDTH", voice, pulse width

This specifies the pulse width to be used by a specified voice. A width of 0, the default on switch-on, cannot be heard very well but 2500 gives quite a nice tone. The pulse width should be in the range 0..4095.

The next command is probably the most complex and needs experimentation for one to be able to predict it's effects with any certainty. It is of the form:

SYS "ENVELOPE", number, timing, p1, p2, p3, stepsin1, stepsin2, stepsin3

Number should be in the range 1..3 specifying one of the three available pitch envelopes. This number should also appear in the envelope position of the sound command if the envelope is to be played.

The second parameter specifies how often the envelope is to be updated in 60th's of a second from 0..127 but if 128 is added to this number then the envelope will automatically repeat itself once the 3 steps have finished, otherwise it will complete the sound with the final pitch played. Then the next three values determine what is to be added or subtracted from the current pitch value being played as often as the timing allows. The three steps determine how many times each of the three pitch values are to be added or subtracted each step.

The final command deals with filtering and is of the form:

SYS"FILTER", voice(s), type, cutoff frequency, resonance

Numbers 1, 2, 4 each correspond to the three voices 1, 2, 3. To filter more than once voice each of the numbers for the associated voices must be added together, thus seven filters all three voices. Type should be 1,2,4 and 5 for low pass, band pass, high pass, and notch reject filters respectively. The cutoff frequency ranges from 0..65535 and specifies the frequency at and around — depending upon the filter type — which the sound is filtered.

Type in program 2, the hex entering and checking program and save it to tape or discette. Then run it and follow the instructions given in the program to enter the Musicode 1.1 hex. dump.

When you have finished entering the hex. dump type Q to get out of the current section in the program then type in 2 to save the machine code on disc or cassette. When all is finished you should have a working copy of the program stored. To load it back into the computer at the beginning of a session type:

LOAD "name", device 1 — this will depend upon whether you use disc or tape — 8 or 1 — and what you have named the program.

SYS 58260 — the computer will now reset as if you have just turned it on

SYS 51680 — now until the computer s reset or turned off the new SYS commands will be active

If you find the hex dump too long or complicated to type in or you haven't the time and you would still like a copy of the program then I can supply copies on cassette complete with a program that will transfer the program to disc if you send a cheque or postal order to the value of £2.50 to the following address: Mr. Philip J. Goward, 28 Trueway Rd., Evington, Leicester LE5 5UG. ■

Program 1

[illegible]

Musicode 1.1 hexdump.

```
C800  A2 00 BD C0 32 C9 00 F0 < 901 >
C808  B0 26 20 C0 3D A9 02 C9 < 845 >
C810  00 F0 03 20 1C C0 C0 EA < 968 >
C818  03 C0 E7 4C 31 EA EA EA < 1239 >
C820  A0 1C 30 00 07 0C 15 EA < 360 >
C828  00 0A A2 00 8D 00 0A A7 < 1092 >
C830  C9 00 D0 03 20 45 C0 0E < 935 >
C838  0A 02 BD 0A 22 C9 FF D0 < 1229 >
C840  03 0C 80 02 50 B0 23 C0 < 938 >
C848  85 B0 A9 D4 35 81 B0 20 < 1221 >
C850  C0 16 03 94 03 9B 00 00 < 916 >
C858  69 03 05 9C 40 81 01 90 < 858 >
C860  29 FE A2 04 91 B0 0D EA < 1203 >
C868  02 30 23 0A 40 A0 07 85 < 613 >
C870  C9 A0 00 85 CA A2 15 A4 < 1052 >
C878  C9 01 90 A4 CA 91 90 E6 < 1489 >
C880  C9 E6 CA CA 30 F1 60 AA < 1536 >
C888  DE CA 02 D0 37 60 60 60 < 943 >
C890  60 4C 1C C0 40 00 81 90 < 894 >
C898  C9 00 F0 20 25 AF C0 04 < 1127 >
C8A0  B3 00 02 C6 AF CD A0 03 < 954 >
C8A8  D0 02 C6 AF CD BC 03 D0 < 1137 >
C8B0  02 C6 AF A5 AF C9 00 F0 < 1156 >
C8B8  0C C9 FF F0 28 A0 FF 90 < 1237 >
C8C0  [illegible] < 1078 >
C8C8  EA 02 AF 03 B1 90 40 C8 < 1003 >
C8D0  B1 90 AE 01 91 B0 9D 87 < 1154 >
C8D8  A2 10 00 91 B0 9D B4 02 < 902 >
C8E0  A0 05 B1 90 9D B4 02 C8 < 1042 >
C8E8  B1 90 9C BD 02 A0 01 B1 < 1018 >
C8F0  90 A0 04 91 B0 A0 02 B1 < 970 >
C8F8  90 90 A0 02 C9 00 D0 01 < 892 >
C900  60 A0 AE FF 9D AE 02 B9 < 1206 >
C908  [illegible]
C910  00 02 9C B1 02 B9 D8 02 < 900 >
C918  9D ED 02 60 DE A0 02 00 < 1076 >
C920  A0 02 3C 01 60 BD 01 02 < 600 >
C928  DD ED 02 D0 43 C0 00 D0 < 1144 >
C930  3F FE AE 02 BD AE 02 C9 < 1059 >
C938  03 D0 12 BD A0 02 A0 00 < 892 >
C940  B9 C3 02 30 06 A9 02 9D < 782 >
C948  A0 02 CF A9 00 9D AE 02 < 760 >
C950  0A E5 9E 0A 10 65 9E 70 < 719 >
C958  A0 02 65 D7 85 9D A9 02 < 940 >
C960  85 9C AE 00 B1 90 9C B1 < 1115 >
C968  02 AE 03 B1 90 9D ED 02 < 890 >
C970  BD AE 02 0A 05 9D 0A 18 < 697 >
C978  63 90 7C [illegible] < 986 >
C980  90 A9 02 85 9C A0 00 B1 < 982 >
C988  98 10 70 B4 02 9D B4 02 < 825 >

C990  A0 03 B1 98 79 B7 02 9D < 962 >
C998  B7 A0 00 23 C9 85 B0 A0 < 1097 >
C9A0  D4 85 B1 8D B4 02 A0 60 < 1053 >
C9A8  91 B0 B0 87 02 C8 91 B0 < 1216 >
C9B0  DE B1 02 BD B1 02 C9 FF < 1225 >
C9B8  D0 03 DE C0 02 BD A0 02 < 1031 >
C9C0  [illegible] < 1011 >
C9C8  A8 02 60 FF FF FF 03 FF < 1292 >
C9D0  FF FF FF FF FF FF FF FF < 2040 >
C9D8  FF FF FF FF FF FF FF FF < 2040 >
C9E0  A9 20 85 73 A9 AA 85 74 < [illegible] >
C9E8  A9 CA 85 75 A9 EA 85 76 < 1275 >
C9F0  85 77 85 78 60 00 00 00 < 601 >
C9F8  00 00 00 00 00 00 FF EA < 489 >
CA00  E6 7A D0 02 E6 7B EA EA < 1383 >
CA08  04 02 A0 40 D1 7A C9 3E < 838 >
CA10  F0 06 A4 02 68 EA EA EA < 1218 >
CA18  06 BE A2 01 A5 00 05 FF < 1041 >
CA20  B1 7A C9 20 B0 03 C0 00 < 1151 >
CA28  F? C9 22 F0 03 4C 12 CA < 1021 >
CA30  A? 00 C8 B1 7A C9 22 F0 < 1136 >
CA38  09 90 C8 83 C6 FF E0 C0 < 1346 >
CA40  09 D0 EF 4C 25 AF C0 90 < 1065 >
CA48  18 65 7A 85 7A A9 00 65 < 770 >
CA50  [illegible] < 1107 >
CA58  C8 85 FE A0 02 81 FD C9 < 1381 >
CA60  08 D0 03 4C 02 CA C5 FF < 1115 >
CA68  F6 0F A0 41 B1 FD AA C0 < 1216 >
CA70  B1 FD 85 FE 86 FD 4C 30 < 1371 >
CA78  CA A0 05 A2 00 81 FD 80 < 1186 >
CA80  E3 03 D0 E6 E6 C8 E4 FF < 1508 >
CA88  D8 F3 20 93 CA 10 A0 8E < 1212 >
CA90  4C 12 CA A0 01 B1 FD 85 < 1027 >
CA98  FB C8 B1 FD 85 FC 6C FB < 1625 >
CAA0  00 0D 3F 4E 41 4D 45 20 < 397 >
CAA8  4E 4F 54 20 46 4F 55 4E < 505 >
CAB0  41 FF A2 00 00 A1 CA 20 < 1069 >
CAB8  02 FF E8 E0 18 D0 F5 4C < 1466 >
CAC0  85 A4 EA EA EA EA EA EA < 1649 >
CAC8  20 FD AE 20 9A AD A5 66 < 1061 >
CAD0  85 FF A9 00 85 66 20 F7 < 187 >
CAD8  B7 AE 14 A4 15 A5 FF 30 < 1022 >
CAE0  0C EA EA EA EA EA EA EA < 1658 >
CAE8  EA EA DA 18 60 38 A5 80 < 951 >
CAF0  E1 14 85 32 A4 A5 00 E5 < 1894 >
CAF8  15 A8 38 60 EA 56 4A 47 < 888 >
CB00  06 0D C0 80 CE 5C 4F 4C < 685 >
CB08  55 4D 45 84 17 C9 10 CC < 690 >
CB10  41 44 53 52 00 21 C8 55 < 627 >
CB18  CC 45 4E 56 45 4C 4F 50 < 741 >

CB20  45 05 20 C8 89 CC 57 49 < 889 >
CB28  44 54 48 04 94 C8 0A EE < 839 >
CB30  46 49 4C 54 45 52 05 40 < 583 >
CB38  C8 17 CD 53 4F 55 4E 44 < 834 >
CB40  00 FF FF FF FF FF FF 9F < 1389 >
CB48  FF FF FF FF FF FF FF FF < 2040 >
CB50  FF FF FF FF FF FF FF FF < 2040 >
CB58  FF FF FF FF FF FF FF FF < 2040 >
CB60  00 00 00 00 00 00 00 00 < 0 >
CB68  00 00 00 00 00 00 07 00 < 131 >
CB70  00 00 00 00 00 00 14 00 < 23 >
CB78  00 00 00 00 00 00 FF 00 < 255 >
CB80  53 FF FF FF FF FF FF B1 < 1742 >
CB88  FF FF FF FF D7 FF FF C3 < 1940 >
CB90  FF FF FF FF FF F7 FF FF < 2032 >
CB98  FF FF FF FF FF FF FF FF < 2040 >
CBA0  00 00 00 00 00 00 00 00 < 133 >
CBA8  00 00 00 00 00 00 00 00 < 215 >
CBB0  00 00 00 00 00 00 00 FF < 255 >
CBB8  00 00 FF 00 00 00 00 00 < 255 >
CBC0  FD FF FF FF FF FF FF 03 < 1314 >
CBC8  FF FF FF FF FF FF FF FF < 2040 >
CBD0  FF FF FF FF FF FF FF FF < 2040 >
CBD8  1E 06 18 0E 00 06 7C 9F < 834 >
CBE0  FA A0 06 03 AC 80 FD C0 < 1187 >
CBE8  E6 D4 0F E1 F0 EE 2C FD < 1595 >
CBF0  11 21 41 81 13 23 43 83 < 496 >
CBF8  15 25 45 85 19 29 49 89 < 536 >
CC00  20 C8 CA 0A 29 0F AA AD < 971 >
CC08  [illegible] < 830 >
CC10  18 6D A7 02 9D A7 02 60 < 753 >
CC18  18 D4 60 20 C8 CA 0A 29 < 815 >
CC20  03 C9 00 D0 01 60 AA 8D < 858 >
CC28  20 C8 05 FB A9 D4 85 FC < 1304 >
CC30  20 3F CC A0 05 91 FB 20 < 892 >
CC38  3F CC A0 06 91 FB 60 20 < 857 >
CC40  C8 CA 0A 29 0F 0A 0A 0A < 636 >
CC48  0A 85 FE 20 C8 CA 84 29 < 1310 >
CC50  0F 18 65 FE 60 20 C8 CA < 824 >
CC58  20 03 D0 01 60 EA E4 EA < 1351 >
CC60  EA 18 69 C2 85 FB A0 02 < 1112 >
CC68  85 FC 20 C8 CA 0A A2 00 < 1117 >
CC70  91 FB A0 03 85 FD E6 FB < 1435 >
CC78  E6 FB E6 FB 20 C8 CA 98 < 1540 >
CC80  48 A0 00 0A 91 FB A0 03 < 919 >
CC88  68 91 FB E6 FB E6 FB E6 < 1582 >
CC90  FB C6 FD D0 E1 E6 FB E6 < 1346 >
CC98  FB E6 FB 20 60 CA A9 00 < 1320 >
CCA0  A5 14 91 FB A5 15 A0 03 < 930 >
CCA8  91 FB E6 FB E6 FB E5 FB < 1338 >

CCB0  20 F0 A5 FD 29 F0 D0 DD < 1752 >
CCB8  30 C8 C0 0A 20 03 D0 01 < 703 >
CCC0  10 A8 BD 22 30 05 F0 A9 < 1242 >
CCC8  34 85 FC 20 C8 CA 98 29 < 1224 >
CCD0  3F A0 03 91 FB 0A 00 01 < 993 >
CCD8  78 60 20 C8 CA 0A 29 0F < 975 >
CCE0  35 FE AD A7 02 29 0F 0D < 926 >
CCE8  57 02 20 C8 CA 29 07 0A < 668 >
CCF0  3A 0A 0A 10 30 A? 02 0D < 473 >
CCF8  57 02 8D 18 34 20 C8 CA < 988 >
CD00  8E 15 D4 0C 16 D4 20 C8 < 98 >
CD08  CA 0A 29 0F 0A 0A 0A 0A < 436 >
CD10  18 65 FE 8D 17 D4 60 AD < 1024 >
CD18  15 03 C9 EA D0 17 78 A9 < 979 >
CD20  90 09 14 03 A9 C8 8D 15 < 695 >
CD28  [illegible]
CD30  32 00 C2 02 58 20 C8 CA < 86 >
CD38  85 FE 20 8C 4A 4A 8D F0 < 903 >
CD40  32 A8 A5 FE 29 03 D0 01 < 842 >
CD48  30 05 FE C6 FE 98 C9 03 < 1231 >
CD50  30 2E A6 FE 0A EA EA EA < 1610 >
CD58  EA EA EA 8D 30 C8 10 03 < 1252 >
CD60  34 85 F8 A9 30 63 03 85 < 926 >
CD68  7C A8 20 98 31 F8 C0 C0 < 1352 >
CD70  [illegible] < 1045 >
CD78  3D 8A 02 90 30 02 EA EA < 1161 >
CD80  AD F8 02 C9 00 F0 03 EE < 1097 >
CD88  F8 07 A0 F8 02 C9 04 D0 < 1070 >
CD90  95 A9 00 8D F8 02 20 C0 < 789 >
CD98  CA 29 0F 8D F8 C8 8D F1 < 1272 >
CDA0  32 20 C8 CA 29 03 8D F2 < 883 >
CDA8  32 20 C8 CA 3E F3 02 8C < 961 >
CDB0  74 02 90 4C 36 14 A9 00 < 853 >
CDB8  35 FD 30 A5 14 38 E9 0C < 928 >
CDC0  30 07 85 14 C6 F9 4C B8 < 1050 >
CDC8  2D A9 08 38 E5 F9 85 FD < 1306 >
CDD0  95 14 0A AA 3D D8 C8 85 < 1106 >
CDD8  FB E8 BD D8 C8 85 FC A5 < 1641 >
CDE0  FD C1 00 F0 11 A? [illegible] < 829 >
CDE8  EA EA EA EA CA 66 FC 60 < 1026 >
CDF0  F8 18 C6 FD 30 F7 A5 FB < 1597 >
CDF8  3D F3 02 A5 FC 80 F4 02 < 1190 >
CE00  30 C8 CA 0E 75 02 8C F6 < 1289 >
CE08  32 A6 FE 8D 20 02 C9 04 < 1018 >
CE10  70 F5 78 C9 10 08 02 A9 < 1109 >
CE18  31 18 85 FD 30 01 8D C0 < 866 >
CE20  32 8D 20 C8 36 F8 18 70 < 991 >
CE28  35 C8 C8 04 38 F8 A0 03 < 1020 >
CE30  35 FC A0 00 39 F8 02 51 < 1117 >
CE38  70 C1 C0 07 30 F6 50 60 < 1280 >
```

Program 2. Example.

```
10 REM FRERE JACQUES
20 DIM F(2,40),L(2,40),T(2),P(2)
30 GOSUB700
40 V=0:I=0:GOSUB1000
50 V=1:I=1:GOSUB1000:F(V,0)=0:L(V,0)=16
60 V=2:I=1:GOSUB1000:F(V,0)=0:L(V,0)=32
70 GOSUB500
80 END
90 :
500 FORI=1TO3:SYS"ADSR",I,0,9,3,0
510 P(I-1)=0:NEXT
520 SYS"VOLUME",15
530 FORI=1TO3:SYS"SOUND",I+12,0,0,0,1
540 SYS"SOUND",I+8,0,0,0,50:NEXT
550 F=0:FORI=0TO2
560 IFP(I)>T(I)THENF=F+1:GOTO600
570 IFPEEK(704+I)=4THEN600
580 SYS"SOUND",I+1,0,0,F(I,P(I)),L(I,P(I))*8
590 P(I)=P(I)+1
600 NEXTI:IFF<3THEN550
610 RETURN
620 :
700 FORV=0TO2:FORI=0TO40
710 L(V,I)=4:NEXTI,V
720 RETURN
730 :
1000 REM READ IN NOTES
1010 RESTORE
1020 FORJ=ITOI+31:READ F(V,J)
1030 F(V,J)=-F(V,J)-60:NEXT
1040 FORJ=ITOI+31:READ L(V,J)
1050 NEXT:T(V)=I+31:RETURN
1060 :
1100 DATA1,3,5,1,1,3,5,1,5,6,8,5,6,8
1110 DATA8,10,8,6,5,1,8,10,8,6,5,1
1120 DATA1,-4,1,1,-4,1
1130 :
1140 DATA2,2,2,2,2,2,2,2,2,2,4,2,2,4
1150 DATA1,1,1,2,2,1,1,1,1,2,2
1160 DATA2,2,4,2,2,E
READY.
```

SHARP MZ-700 SERIES
USERS MAGAZINE
OVER 140 PROGRAMS
4 BOOKS
12 PERIPHERALS
SPECIAL OFFER
SEND FOR OUR COLOUR CATALOGUE NOW
SOLO SOFTWARE
95B BLACKPOLE TRADING ESTATE
WORCESTER WR3 8TJ
TELEPHONE (0905) 58351

HOT FROM
SEGA
THE ARCADE WINNERS
released *NOW*
SPY HUNTER
THE OFFICIAL HOME VERSION OF BALLY MIDWAY'S ARCADE HIT
· You control the turbo charged race car/hydro spy boat.
· You control a deadly arsenal of missiles, machine guns, oil slicks and smoke screens.
· Sophisticated spy-challenging graphics.
U.S. Gold is stocked by
John Menzies WILDINGS
WOOLWORTH, WHSMITH,
Rumbelows
and Spectrum Shops
Bally/MIDWAY
SPY HUNTER
NEW!
OFFICIAL SEGA ARCADE GAME
Up'n Down
NEW!
BUCK ROGERS
Congo Bongo
ZAXXON
Bally/MIDWAY
TAPPER
NEW!
64
COMMODORE CASSETTE 9·95
DISK 12·95
SPECTRUM CASSETTE 7·95
U.S. GOLD
All American Software
Exclusive manufacturers for SEGA and Bally MIDWAY.
For release schedule and trade details contact:
Centre Soft, Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Telephone: 021-359 3020. Telex: 337268.

TAPE TO MICRODRIVE

Colin Carruthers' easy conversion program

THE INTRODUCTION of the Sinclair ZX Microdrive system offers many users fast access to programs and data. Programs which once took several minutes to load can now be available in a matter of seconds. In fact, anyone who has used a Microdrive may be discouraged from using cassette-based software.

However, there are very few commercial programs available for the Microdrive due to the difficulty in duplicating large numbers of cartridges. Few software houses seem prepared to release details on how to convert their own programs for use on Microdrive for fear of escalating the piracy problem.

This is a weak argument since anyone with two cassette recorders and a blank tape can copy any program they wish. Several houses do release details, particularly publishers of serious software such as Tasman (Tasword), Campbell (Masterfile) and Hisoft with its series of compilers and assemblers.

Why should loading material from tape and saving on Microdrive cartridge present a problem? To answer that, we need to consider certain aspects of the operation of a Microdrive. If you examine the diagram in Chapter 24 of the standard Spectrum manual showing Ram allocation, you will see that there are two areas labelled "Microdrive Maps" and "Channel Information".

Whenever any Microdrive operation is invoked, these two areas grow by 32 and 595 bytes respectively. The Map holds information about the distribution of the 512 byte long blocks on the cartridge, while the Channel contains a 512 byte buffer along with details such as file name and type — see Microdrive and Interface 1 manual, Appendix 3.

In operation, consecutive blocks are passed via the buffer from the cartridge to memory or *vice versa* — depending on whether we are loading or saving. The main point is that the Basic program and variables must be moved up by 627 — ie, 32 + 595 — bytes. To make matters worse, Interface 1 appends 58 new bytes to the existing System Variables area. Thus, the Basic program resides at an address which is some 685 bytes higher up in memory when using the Microdrive.

So, why does this present us with a problem? Well, blocks of machine code which once loaded into the free space just above the Basic area might now overwrite part of the Basic program or, worse still, part of the Microdrive Map or Channel. Either way, the system is likely to crash with the Microdrive running, leaving us no option but to unplug the Spectrum and risk corrupting the material stored on the cartridge.

Programs can be divided into three categories. Those which are easy to convert to Microdrive — by the virtue of the addresses used, those which can be loaded into a higher memory address and copied down to their proper target address before being executed, and those which need to be divided into two smaller blocks and moved around after loading.

The first category includes programs written entirely in Basic — simply break into them and save auto-start on cartridge — and programs that have machine-code blocks which start at high addresses. Any block which starts above 25000 would normally fall into this category, but this does depend on the size of the Basic loader program. Program 1 gives lots of useful information about material stored on tape such as auto-start line number for Basic programs along with length and start address of machine-code blocks.

To use, simply run it and play back the relevant tape at normal load volume and tone settings. For each block in the program you wish to convert, note down all the details or dump the screen onto a printer.

Typical output from program 1 might look like:

```
Name    : Superzap
Type    : Basic
Start   : 10
Length  : 132 bytes

Name    : Screen
Type    : Bytes
Start   : 16384
Length  : 6912 bytes

Name    : Superzap
Type    : Bytes
Start   : 32768
Length  : 32768
```

This is a fairly standard format, ie, Basic loader, title screen and main code block. Type New and Merge in the Basic loader. It might look something like this:

```
10 CLEAR 32767
20 LOAD "" CODE: LOAD "" CODE
30 PRINT USR 35000
```

It is probably best to forget the title screen. They are designed mainly to keep people amused while the main code loads. Besides, space on a cartridge is relatively expensive. Edit the program to make it load the main code from Microdrive thus:

```
10 CLEAR 32767
20 LOAD *"m";1;"Superzap c" CODE
30 PRINT USR 35000
```

Note that we have had to change the name of the code block since we cannot have two files with the same name on the cartridge. Save this on Microdrive to auto-run from line 10. Now do:

```
CLEAR 32767 : LOAD "" CODE
```

to load in the main code from tape. Save this to cartridge by typing in, for example:

```
SAVE *"m";1;"Superzap.c" CODE 32768,32768
```

Reset the system by typing Print USR 0 and try loading in the program from Microdrive. Should there be any problems, check carefully that all addresses were typed in correctly.

We need to adopt a different strategy for programs with machine-code blocks which start below about 25000. For example, imagine a situation where the main block was 9000 bytes starting at address 24000. Clearly, this would overwrite the Microdrive Channel and Basic program if we were to load it in from Microdrive to this address.

The solution is to load the code into a high address and use program 2 to generate a machine-code routine to copy it down to the correct place in memory. Program 2 does this by using the powerful — not to mention fast — LDIR instruction. To continue the above example, we would start by loading in the code from tape to — for example — 30000. Run Program 2 and enter the following values:

```
Block Start       : 30000
Block Length      : 9000
New Address       : 24000
Execute Address   : 24000
```

The execute address can be found by examining the Basic loader for that program. Program 2 places a 14 byte copy routine at "start + length", 39000 in this case. Save this

(continued on page 105)

(continued from page 103)
to cartridge with something like

SAVE *"m";1;"File Name" CODE 30000,9014.

Note that the length has been extended by 14 to save both the code and the copy routine. Change the Basic loader to load in the machine-code from Microdrive, and the execute address — Print USR nnnnn — to be the start of the copy routine. Save this auto-run on Microdrive, reset the system and try it out.

But what about machine-code blocks which are too large to re-locate using the above technique? For example, say we had a block which was 41535 bytes long starting from location 24000. This block fills the memory from the top right down to address 24000, and does not leave space for any Microdrive operations.

What we need to do here is split the block into two, load the high address part into its proper location, load the low address part into the display file and then use the copy routine provided by program 2 to move the low block up to its correct address after all Microdrive operations are over. To continue the above example, first type:

CLEAR 23999 : LOAD " " CODE

Copy the bottom 1000 bytes into the display file using a short program such as:

```
10 For x=0 TO 999
20 POKE 16386+x, PEEK (24000+x)
30 NEXT x
```

and save this block to a temporary file on tape with

SAVE "temp" CODE 16386,1000

Now do a Clear 24999 to make space for the Microdrive system and save the top part to Microdrive cartridge with

SAVE *"m";1;"High" CODE 25000,40535

Reset the system, load in program 2 and then the temp code file from tape back into the display file. Start program 2 — by typing Go to 10, not Run which would clear the display file — and enter the following values:

Block Start	:	16386
Block Length	:	1000
New Address	:	24000
Execute Address	:	24000

Save this to Microdrive using

SAVE *"m";1;"Low" CODE 16386,1014

noting once again that the length must be increased by 14 to include the copy routine.

Finally, alter the Basic loader so that it loads in "High" and "Low" from Microdrive before doing a

PRINT USR 17386

Save this on the same cartridge, reset the system and take a deep breath before trying it out.

One word of warning. In all cases, think carefully where the stack is — if this is overwritten by anything a system crash is certain. The position of the stack is controlled by the Clear statement so many problems like this can be avoided.

With the help of the ideas presented in this article, it is possible to convert most programs to load from Microdrive. The time spent waiting for programs to load becomes negligible which means that the Spectrum owner can spend more time playing games and less time sitting around with nothing to do.

It is probably a good idea to have a menu program on each cartridge called "run" which lists the programs available. Program 3 gives an example of the one I use, and reduces program loading to three key presses — Run, Enter and n where n is the selected program.

Program 1.

```
1 REM ***********************
2 REM *                     *
3 REM * Program 1           *
4 REM *                     *
5 REM *   Header            *
6 REM *                     *
7 REM * Colin Carruthers    *
8 REM *                     *
9 REM ***********************
10 DATA 55
15 DATA 62,0
20 DATA 221,33,0,0
25 DATA 17,17,0
30 DATA 205,86,5
35 DATA 1,1,0
40 DATA 216
45 DATA 11
50 DATA 201
55 BORDER 0: PAPER 0: INK 7: C
LS : PRINT "Header Version 2.0"
60 RESTORE : FOR x=USR "1" TO
USR "n"+2: READ a: POKE x,a: NEX
T x
70 POKE USR "1"+5,PEEK 23675:
POKE USR "1"+6,PEEK 23676
80 DIM t$(4,5): FOR x=1 TO 4:
READ t$(x): NEXT x
90 DATA "Basic","Data","Data",
"Bytes"
110 LET l=USR USR "1"
115 IF PEEK USR "b"=0 THEN GO T
O 110
117 IF l=0 THEN PRINT : PRINT "
Tape Loading Error": GO TO 150
120 PRINT : PRINT "Name  :";: F
OR x=USR "a"+1 TO USR "b"+2: PRI
NT CHR$ PEEK x;: NEXT x: PRINT :
 PRINT "Type  :";t$(PEEK USR "a"
+1)
125 LET b=USR "b"
130 PRINT "Start :";PEEK (b+5)+
256*PEEK (b+6)
140 PRINT "Length:";PEEK (b+3)+
256*PEEK (b+4);" bytes"
150 POKE 23692,255: POKE USR "b
",0: GO TO 110
```

Program 2.

```
1 REM ***********************
2 REM *                     *
3 REM * Program 2           *
4 REM *                     *
5 REM * - Block Copy        *
6 REM *                     *
7 REM * Colin Carruthers    *
8 REM *                     *
9 REM ***********************
10 DEF FN l(x)=x-256*INT (x/25
6)
20 DEF FN h(x)=INT (x/256)
30 INPUT "Block Start    :";st
art
40 INPUT "Block Length   :";le
ngth
50 INPUT "New Address    :";de
st
60 INPUT "Execute Address:";ex
100 LET code=start+length
110 LET x=0
120 READ v
125 IF v=999 THEN STOP
130 POKE code+x,v
140 LET x=x+1
150 GO TO 120
200 DATA 33,FN l(start),FN h(st
art),1,FN l(length),FN h(length)
,17,FN l(dest),FN h(dest),237,17
6,195,FN l(ex),FN h(ex)
210 DATA 999
```

Program 3.

```
1 REM ***********************
2 REM *                     *
3 REM * Program 3           *
4 REM *                     *
5 REM * - Typical run File  *
6 REM *                     *
7 REM * Colin Carruthers    *
8 REM *                     *
9 REM ***********************
10 BORDER 0: PAPER 0: INK 7: C
LS
20 PRINT CHR$ (16);CHR$ (6);"C
C: Vol 07   22-Mar-84"
30 PRINT : PRINT
40 PRINT "1 - Fighter Pilot"
50 PRINT "2 - Manic Miner"
60 PRINT "3 - Jet Set Willy"
480 PRINT
490 PRINT CHR$ (16);CHR$ (6);"0
 - Quit"
500 IF INKEY$="1" THEN CLS : PR
INT AT 10,9;"Fighter Pilot": LOA
D *"m";1;"Fighter.c"CODE 30000:
RANDOMIZE USR 63792
510 IF INKEY$="2" THEN CLEAR 30
000: PRINT AT 10,10;"Manic Miner
": LOAD *"m";1;"Manic.c"CODE : P
RINT USR 33792
520 IF INKEY$="3" THEN CLEAR 30
000: LOAD *"m";1;"Jetset.c"CODE
: CLEAR 25000: PRINT USR 33792
980 IF INKEY$="0" THEN GO TO 10
000
990 GO TO 500
```

■

NEWS-MONGER

Hear the latest from Franf Zym and his ZX-81.

NEWSMONGER IS a menu-driven program for the ZX-81 15K to show a text in giant letters. The menu has nine options:

- Character size 8 by 8.
- Character size 16 by 16.
- Character size 16 by 24.
- User-defined graphics.
- Fill character.
- Speed.
- Input text.
- Top line number.
- Save.

The almost entirely Basic program uses a machine-code routine held in line 0. The machine code is only 576 bytes long. The text may contain unshifted characters, inverse — shifted — function — and graphics.

The function characters plus the shifted character H represent the lower case characters. The shifted characters A, S, D, F, G, W, E, R, T, Y, 2, 3 and 4 are reserved for user defined graphics — UDGs. You can define eg., the character "!" and its inverse, which do not belong to the standard character set. When you don't like the lower case character set, you are also able to alter this.

In total you have 26 + 13 UDG's. You can't alter the "shifted" character Q because this character is used in string input. When you are not familiar with UDG's, read the article in *Your Computer* April 1984.

The data of the standard ZX-81 character set begin in the Rom at address $1E00 (7680 dec.) and end at address $1FFF (8191 dec.) Only the data of the characters with code 0-53 are in the Rom.

The data of the UDGs begin at address 16760; it starts with the data of the "shifted" character Q — code 192. Then the data of the "function" characters with code 193-215, followed by the "shifted" characters with code 216-229. The data of the "function" characters M, B and T with code 64-66 are placed after the "shifted" characters.

You have the option to alter the fill character of the giant letter, the speed and the top line number. The fill character can be a "unshifted" character, a inverse — or a graphic. Address 16690 holds the code.

PEEK(16751)/2-1

gives you the speed on a scale 0-9; 0 is fast, 9 is slow. 5 is the most "readable" speed. The top line number can vary for option 1 from 1-17, for option 2 from 1-9 and for option 3 the top line number will be 1. The program checks for invalid values.

There are different ways to save text. First you can run the program and enter your text in option 7:

"TEXT" N/L Z$

holds your text. Returning to option 7 and typing new text the old text is rubbed out. To prevent the loss of the old string variable Z$, you have to break out during input mode by

(continued on next page)

Hexdump.

Address	Hex	Sum
16514:	0000000000000000	= 0
16522:	3F0D218A40221540	= 431
16530:	CD1C11234E234523	= 503
16538:	C5E5CDBB022CE1C1	= 1282
16546:	C0C5E57EFE40280A	= 1112
16554:	FE412806FE422802	= 727
16562:	180306A680322140	= 474
16570:	CBBF060816005F21	= 558
16578:	00001910FD3A2140	= 449
16586:	FEC03805117B3F18	= 731
16594:	0311001E19CDEA40	= 578
16602:	E123C10D20BA78FE	= 1058
16610:	0028A7050E0018B0	= 426
16618:	E5118240D5010800	= 662
16626:	EDB03A2140CB7F28	= 938
16634:	0FCB77200A118240	= 591
16642:	06081A2F121310FA	= 390
16650:	0E0806080C506012A	= 282
16658:	0C40112200ED5211	= 463
16666:	21001910FAC1227B	= 674
16674:	401121001 9D11ACB	= 577
16682:	7F171213D528033E	= 505
16690:	807710EDD1C50601	= 913
16698:	C52A3440CB4520F9	= 908
16706:	CD5641CD6D41C110	= 944
16714:	EFC10D118240D520	= 901
16722:	B9D1E1C92A7B4023	= 1084
16730:	233E08545D23011F	= 349
16738:	00EDB0287023233D	= 699
16746:	C818F021A00C2B7C	= 836
16754:	B520FBC905050024	= 711
16762:	2400000000000000	= 36
16770:	3E4040403E000000	= 316
16778:	7C42427C40400505	= 518
16786:	0505050505050008	= 38
16794:	0008080808000004	= 36
16802:	0004040404380020	= 104
16810:	2438242222000000	= 196
16818:	3E42423E02020000	= 260
16826:	4949494936000000	= 346
16834:	3C427C403C000000	= 374
16842:	3C023E423E000000	= 252
16850:	3C403C023C000002	= 248
16858:	023E42423E000000	= 258
16866:	3E0408103E000000	= 152
16874:	2214081422000000	= 116
16882:	3E20202020000040	= 254
16890:	407C42424200000E	= 400
16898:	107C101010000000	= 188
16906:	3E42423E023C0000	= 318
16914:	3C42424230000020	= 350
16922:	2020202010000000	= 156
16930:	2222120C04180000	= 126
16938:	222222221E000000	= 156
16946:	3C22222222000000	= 196
16954:	2222221408008000	= 258
16962:	00000000000000E0	= 224
16970:	E000000000000F0F0	= 704
16978:	F07E7E7E7E000505	= 754
16986:	0505050505050505	= 40
16994:	0505050505050000	= 30
17002:	000000000E00000	= 224
17010:	0505050505050505	= 40
17018:	0505050505050010	= 46
17026:	1010100010000505	= 74
17034:	0505050505050024	= 66
17042:	0024242404380505	= 178
17050:	0505050505050505	= 40
17058:	0505050505050010	= 46
17066:	7C1010100E000040	= 250
17074:	407C42427C000000	= 444
17082:	7649494949000505	= 420

(continued from previous page)

rubbing out the first quote and then press "shifted" A N/L. Then you type:

LET A$ = Z$ N/L

and the old text is saved in the variables area. You return to the Basic program by typing:

GOTO 0 N/L

Do not use the command Run because this command will also clear the variables area, and that is what you don't want!

Second, you can break out during input mode to enter different string variables. You can use the string variables A$-X$ and subscripted string variables with no limitations.

You can rub out the quotes

Do not use Y$ and Z$ because the program uses these string variables. You can type eg.: LET A$ = "TEXT" N/L, LET B$ = "TEXT" N/L, D M A$(10,10) N/L, LET A$(1) = "TEXT" N/L.

You return to the menu by typing:
—GOTO 0 N/L

When you return to option 7, you can rub out the quotes and type eg.:

A$ + B$ N/L

strings which you have entered before. Z$ holds then

A$ + B$

You can also type: Text, jump over the quote and type:

+ A$ N/L

Z holds then

"TEXT" + A$

When you want to save on tape the string variables or your UDGs, option 9 gives you the opportunity. After typing: 9 N/L during menu mode, the program waits for pressing a key. It gives you the time to set up the tape recorder.

When you want to break out the machine code routine during option 1-3, just press a key a while. It is advisable not to use the "break" key because then you also break out the Basic program. Then it is a habit to type: Run N/L, but then you will clear the variables area. Use always the command Goto 0, and you will get the menu again with the variables still present.

Before you can enter the machine code, you have to make a line with a Rem containing at least 576 bytes. To create this Rem first enter line 1 with a Rem containing 91 dots. Check the number with

PEEK(16511) + PEEK(16512) × 256

The number must be 93:

REM + 91 dots + N/L

Then using the Edit alter the line number so that you become 6 lines with 91 dots. Then type:

POKE 16514 118 N/L
POKE 16515 118 N/L
POKE 16510 0 N/L
POKE 16511 66 N/L

and you have created line 0 with a Rem containing 567 bytes.

PEEK(16514 + 576)

must be 118, check this! Then enter the Basic program hexload. The startaddress is 16514, the endaddress 17089. Save the program on tape after entering the hexadecimal numbers. Then enter:

LET Z$ = "TEXT" N/L, LET L = USR 13524 N/L

and the program should run. Pressing a key a while will bring you back to Basic. When the program doesn't work, check the addresses 16514-17089. ■

Hexloader.

```
 90 REM HEX LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=S TO F STEP 8
150 LET T=0
160 PRINT N;" - ";
170 INPUT A$
180 PRINT A$;" = ";
190 INPUT TOT
200 PRINT TOT
210 LET Z=0
220 FOR K=1 TO LEN A$ STEP 2
230 LET C=(CODE A$(K)-28)*16+CO
DE A$(K+1)-28
240 LET T=T+C
250 POKE N+Z,C
260 LET Z=Z+1
270 NEXT K
280 IF TOT=T THEN GO TO 310
290 PRINT "ERROR - PLEASE INPUT
AGAIN"
300 GO TO 150
310 NEXT N
```

Basic program.

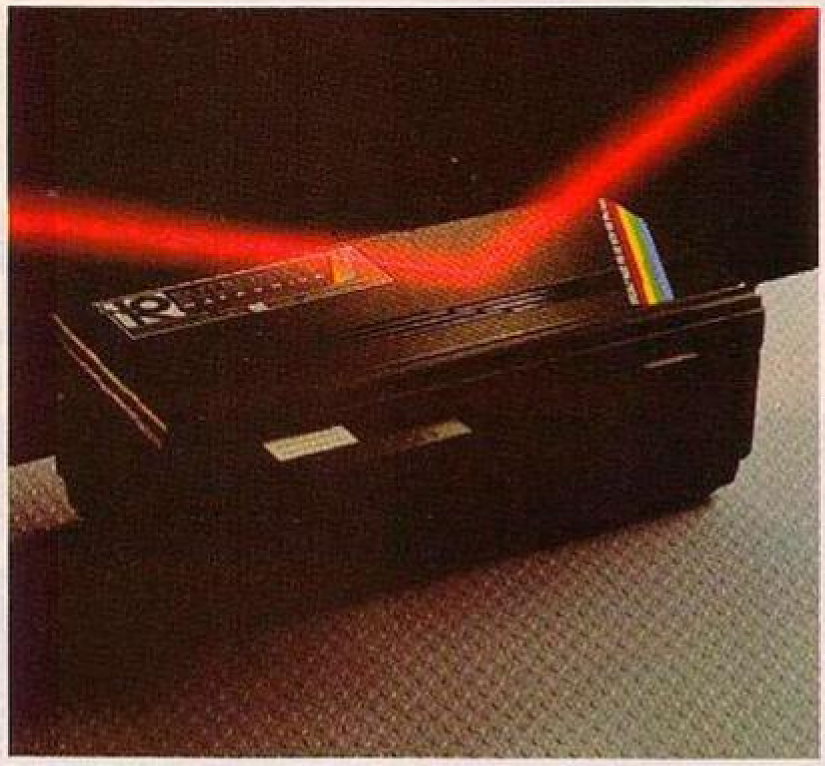
```
   1 REM ************************
   2 REM *(C) FRANS ZIJM         *
   3 REM *  NEWSMONGER           *
   4 REM ************************
  20 SLOW
  30 PRINT "  MENU",,,,
  40 PRINT "1 CHARACTER SIZE 8X8
",,,
  50 PRINT "2 CHARACTER SIZE 16X
16",,,
  60 PRINT "3 CHARACTER SIZE 16X
24",,,
  70 PRINT "4 USER DEFINED GRAPH
IC",,,
  80 PRINT "5 FILL CHARACTER",,,
  90 PRINT "6 SPEED",,,
 100 PRINT "7 INPUT TEXT",,,,
 110 PRINT "8 TOP LINE NUMBER",,
,
 120 PRINT "9 SAVE"
 130 PRINT AT 21,0;"YOUR OPTION?
"
 140 DIM Y$(1)
 150 INPUT Y$
 160 IF Y$<"1" OR Y$>"9" THEN GO
TO 150
 170 CLS
 180 IF Y$="9" THEN GOTO 9000
 190 GOSUB VAL Y$*1000
 200 CLS
 210 GOTO 20
1000 POKE 16697,1
1010 POKE 16676,33
1020 POKE 16732,8
1030 LET L=USR 16524
1040 RETURN
2000 POKE 16697,2
2010 POKE 16676,65
2020 IF PEEK 16655>9 THEN POKE 1
6655,9
2030 POKE 16732,16
2040 LET L=USR 16524
2050 RETURN
3000 POKE 16697,2
3010 POKE 16676,99
3020 POKE 16655,1
3030 POKE 16732,24
3040 LET L=USR 16524
3050 RETURN
4000 PRINT "YOU CAN DEFINE YOUR
OWN GRAPHIC.
4010 PRINT "FOR UDG ARE THE ""SH
IFTED"""
4020 PRINT "CHARACTERS A,S,D,F,G
,U,E,R,T,Y,"
4030 PRINT "2,3 AND 4 AVAIABLE.Y
OU CAN ALSO",,,
4040 PRINT "ALTER THE LOWER CASE
 CHARACTERS."
4050 PRINT "THEREFOR ARE THE ""F
UNCTION"" CHA-",,
4060 PRINT "RACTERS PLUS ""SHIFT
ED"" H.THE",,
4070 PRINT "EMPTY STRING WILL RE
TURN YOU TO",,
4080 PRINT "THE MENU."
4090 PRINT AT 20,0;"WHICH ""SHIFT
ED"" OR ""FUNCTION"""
4100 PRINT "CHARACTER"
4110 DIM Y$(1)
4120 INPUT Y$
4130 IF Y$="" THEN RETURN
4140 IF Y$="INKEY$" OR Y$="AT" O
R Y$="AND" THEN GOTO 4160
4150 IF Y$<"AT " THEN GOTO 4100
4160 CLS
4170 LET S=0
4180 IF Y$="INKEY$" OR Y$="PI" O
R Y$="AND" THEN LET S=166*8
4190 LET S=S+15224+CODE Y$*8
4200 PRINT "INPUT P FOR A BLACK
SQUARE,THE"
4210 PRINT "EMPTY STRING FOR A S
PACE.A DOT",,,
4220 PRINT "WILL MARK THE PLACE.
INPUT 0 AT",,,
4230 PRINT "THE BEGINNING OF A L
INE WILL",,,
4240 PRINT "PLACE 8 SPACES IN TH
E LINE.",,,
4250 FOR I=1 TO 6
4260 PRINT TAB I;I;
4270 NEXT I
4280 PRINT
4290 FOR I=0 TO 7
4300 PRINT I+1;
4310 LET T=0
4320 FOR J=7 TO 0 STEP -1
4330 INPUT Y$
4340 IF J=7 AND Y$="0" THEN PRIN
T "........";
4350 IF J=7 AND Y$="0" THEN GOTO
 4420
4360 IF Y$="P" THEN LET T=T+2**J
4370 IF Y$="P" THEN LET Y$="■"
4380 IF Y$="" THEN LET Y$="."
4390 IF Y$<>"■" AND Y$<>"." THEN
 GOTO 4330
4400 PRINT Y$;
4410 NEXT J
4420 POKE S+I,T
4430 PRINT
4440 NEXT I
4450 RETURN
5000 PRINT "YOU CAN FILL THE GIA
NT LETTER",,,
5010 PRINT "WITH A CHARACTER OF
YOUR CHOISE.",,
5020 PRINT "THE PRESENT FILL CHA
RACTER ";CHR$ PEEK 16690;".",,
5030 PRINT "THE EMPTY STRING WIL
L NOT ALTER"
5040 PRINT "THE CHARACTER."
5050 PRINT AT 21,0;"YOUR OPTION?
"
5060 DIM Y$(1)
5070 INPUT Y$
5080 IF Y$="" THEN RETURN
5090 IF Y$>"Z" AND Y$<"■" OR Y$>
"■" THEN GOTO 5070
5100 POKE 16690,CODE Y$
5110 RETURN
6000 PRINT "YOU CAN ALTER THE SP
EED.THE",,
6010 PRINT "PRESENT SPEED ON A S
CALE 0-9 ";PEEK 16751/2-1;".",,
6020 PRINT "THE EMPTY STRING WIL
L NOT ALTER",,
6030 PRINT "THE NUMBER."
6040 PRINT AT 21,0;"YOUR OPTION
ON THE SCALE 0-9 ?"
6050 DIM Y$(1)
6060 INPUT Y$
6070 IF Y$="" THEN RETURN
6080 IF Y$<"0" OR Y$>"9" THEN GO
TO 6060
6090 POKE 16751,(VAL Y$+1)*2
6100 RETURN
7000 POKE 16418,0
7010 PRINT "YOU CAN ENTER YOUR T
EXT.Z$ IS",,
7020 PRINT "USED TO STORE THE IN
PUT.YOU CAN",,
7030 PRINT "INPUT CHARACTERS,INV
ERSE -,",,
7040 PRINT "GRAPHICS -,""SHIFTED
"" - AND",,
7050 PRINT """FUNCTION"" -.THE "
"FUNCTION""",,
7060 PRINT "CHARACTERS REPRESENT
 THE LOWER",,
7070 PRINT "CASE CHARACTERS.EXCE
PTION THE",,
7080 PRINT """SHIFTED"" KEY H RE
PRESENT LOWER",,
7090 PRINT "CASE U.THE ""SHIFTED
"" KEYS A,S,",,
7100 PRINT "D,F,G,U,E,R,T,Y,2,3
AND 4 ARE",,
7110 PRINT "USED FOR LOG.SEE OPT
ION 4.",,,
7120 PRINT "PRESS A KEY TO CONTI
NUE."
7130 IF INKEY$="" THEN GOTO 7130
7140 CLS
7150 POKE 16418,2
7160 PRINT AT 21,0;"YOUR TEXT?"
7170 INPUT Z$
7180 RETURN
8000 PRINT "YOU CAN CHOOSE THE P
LACE OF THE",,
8010 PRINT "TEXT ON THE SCREEN.
FOR OPTION ",,
8020 PRINT "1 THE TOP LINE CAN V
ARY 1-17.",,
8030 PRINT "FOR OPTION 2 THE TOP
 LINE CAN",,
8040 PRINT "VARY 1-9.FOR OPTION
3 THE TOP",,
8050 PRINT "LINE WILL BE 1.THE P
RESENT TOP"
8060 PRINT "LINE NUMBER: ";PEEK 1
6655;".THE EMPTY STRING",,
8070 PRINT "WILL NOT ALTER THE N
UMBER."
8080 PRINT AT 21,0;"YOUR OPTION?
"
8090 DIM Y$(2)
8100 INPUT Y$
8110 IF Y$="" THEN RETURN
8120 IF VAL Y$<1 OR VAL Y$>17 TH
EN GOTO 8100
8130 POKE 16655,VAL Y$
8140 RETURN
9000 PRINT AT 20,0;"PRESS A KEY
TO RECORD BUT DO NOT"
9010 PRINT "PRESS THE ""BREAK"" KE
Y."
9020 IF INKEY$="" THEN GOTO 9020
9030 CLS
9040 SAVE "NEWSMONGER"
9050 GOTO 0
```

ROTRONICS WAFADRIVE FOR 48K SPECTRUM/ SPECTRUM+

Dual 128K storage. Fast access. Centronics and RS232 interfaces. And now FOUR free wafers from SMT, including the Spectral Writer word processing package. We're now including a free 16K, 64K and 128K wafer with each Wafadrive. All this makes the price of £129.95 (inc. p & p) even more attractive.

The Rotronics Wafadrive has now proved itself as the storage system that offers more. More features, more reliability and more speed. Its micro interface, two 128K drives, RS232 and Centronics ports are all contained within one attractively-styled, compact unit. Wafadrive achieves very fast loading and saving but not at the expense of reliability, which is on a par with floppy disk.

The fully interchangeable wafers are available in three sizes – 16K, 64K and 128K. Low capacity wafers are most suitable for program development as they offer faster access. High capacity is most suited to general data storage. Loading rate is well over ten times as fast as cassette!



Software selection is ever growing – see list below for details. A full colour brochure on Wafadrive and up-to-the-minute software and accessory information is available.

Look to SMT for the best deal on all Rotronics peripherals

ROTRONICS DX-85 DOT MATRIX PRINTER

High quality and high speed. The DX-85 prints bi-directionally at 100 cps, logic-seeking. It offers a 96 character set at 10/12.5/16.5 cpi which extends column width up to 132 characters. Programmable typefaces including extended and italic. Centronics interface standard and free dust cover supplied. Options include typewriter ribbon adaptor, telex roll holder, RS232 serial interface and sheet feeder.

See our special price when bought with Wafadrive. This offer also applies to previous SMT Wafadrive customers (proof of purchase required).

WAFADRIVE PLUS DX-85 PRINTER ONLY £299.95
DX-85 PRINTER ONLY £199.95

ROTRONICS PORTABLE CASE

Tailored foam insert holds ZX81/Spectrum/Spectrum+/VIC20/CBM64, with C2N/DR2301 manuals and cassettes within executive style case. All components remain fully operational in situ.

Size 138mm x 700mm x 363mm.
ONLY £34.45 (p&p £2.50).

ORDER FORM

Please send (enter as appropriate)

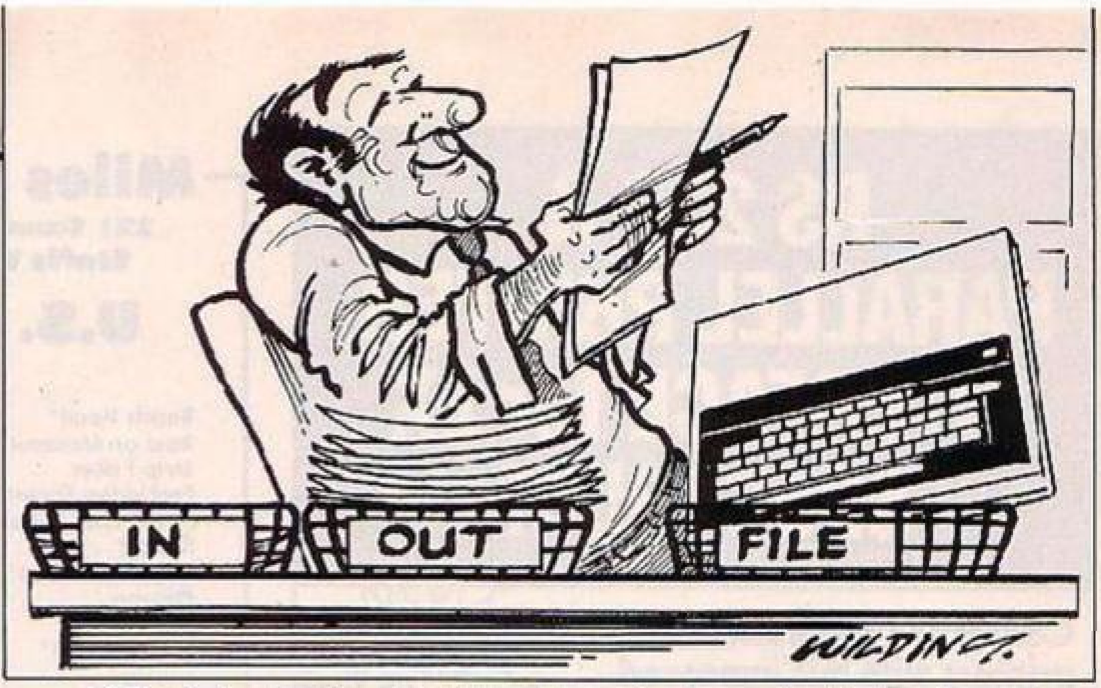
Qty	Item	Price	
___	Rotronics Wafadrive	@ £129.95 each	___
___	Rotronics DX-85 Printer	@ £199.95 each	___
___	Wafadrive plus DX-85 Printer	@ £299.95 pair	___
___	Rotronics Portable Case for ZX81/Spectrum/Spectrum+/VIC20/CBM64 with C2N/DR2301*	@ £36.95 each	___
___	16K wafer	@ £3.45 each	___
___	64K wafer	@ £3.65 each	___
___	128K wafer	@ £3.95 each	___
___	Heathrow/Nightflite II	@ £14.95 each	___
___	Space Wars/Seiddab Attack/Luna Attack	@ £14.95 each	___
___	Bear Bovver/Wong's Loony Laundry/World Cup	@ £9.95 each	___
___	The Artist	@ £9.95 each	___
___	Starbike	@ £7.95 each	___
___	ZAP Machine Code	@ £19.95 each	___
___	Sherlock	@ £14.95 each	___
___	RS232 lead	@ £9.95 each	___
___	Centronics lead	@ £9.95 each	___
	All prices include VAT and p & p	TOTAL	£___

☐ I enclose a cheque/PO* made payable to SMT — YC/2/85
☐ Debit my Access/Barclaycard* account no. ______ (*delete as applicable)
Signature ______
Name ______
Address ______

Send to: SMT, FREEPOST, Greens Norton, Towcester, Northants. NN12 8BR
No stamp required
Please allow 28 days for delivery.

SMT

VIC 20 and CBM 64 are registered trademarks of Commodore Business Machines.



SUPERFILE

BA Naylor and DW Boyce and a BBC database.

SUPERFILE IS a versatile database written for the BBC Micro 32K model. This may be used for various applications ranging from the small home-based business to the family's video cassette library. The question is often asked what a database actually is. In short, it may be described as a computerised filing cabinet that allows rapid data collection and retrieval.

Data is stored on cassette in the form of a file, each file being split up into records, each of these records being further divided into individual items of data called fields. It is advisable to become acquainted with these terms as they are used many times in this article.

Superfile has a capacity of up to 10 fields each with up to 25 characters, allowing 65 records with this configuration, or two fields with 325 records, these being the two extremes of the system. It is obvious therefore, that the number of records is calculated by dividing 650 by the number of fields entered.

Incorporated in the system is a unique Sort which can rapidly arrange records in order alphabetically or numerically, with the user choosing the field to be sorted. Another great asset to the system is the multi function Search procedure. This allows the full use of equalities to seek a particular item in the file.

The whole system has been very efficiently designed and programmed to aid the user and process the data as quickly as possible. On

(continued on page 117)

```
   10REM SUPERFILE Database
   20REM by B A Naylor and
   30REM    D W Boyce
   70MODE7
   80SE=0:ST=0:r=1:red=0:head=0
   90*OPT3,5
  100*OPT1,1
  110PROCin:PROCm
  120DEFPROCin:PRINTTAB(0,0);CHR$132;CHR$157;CHR$131:C
HR$141;"   SUPER  FILE";CHR$133;"  Data Base.":PRINTTA
B(0,1);CHR$132;CHR$157;CHR$130;CHR$141;"   SUPER  FILE
";CHR$129;"  Data Base."
  130PRINTTAB(0,22);CHR$132;CHR$157;CHR$131;CHR$141;"
 B A Naylor  &  D W M Boyce.":PRINTTAB(0,23);CHR$132;C
HR$157;CHR$130;CHR$141;"  B A Naylor  &  D W M Boyce."
:VDU28,0,21,39,3
  140PROCh("Set_Up")
  150PRINTCHR$134;"The no. of Fields :":PROCi(20,3,2,"
I"):F=VAL(s$)
  160PRINT:IF F>10 ORF<2 THENPROCn:PRINTCHR$129;"Field
s (2 to 10). Try again.":IN=GET:GOTO140
  170R=INT(650/F)
  180PRINTCHR$134;"The max no. of Records :";R
  190 PRINTCHR$134;"Are you happy with this (Y/N) ?":I
N$=GET$:IF IN$="N" THEN 140
  200DIMA$(F,R),SI$(F),no(F),label$(F),ITEM$(F),AL(F),
MATCH(R),tot(F):f$="":FOR I%=1 TO F:SI$(I%)="S":no(I%)
=25:label$(I%)="...":NEXT:FOR I%=1 TO R:MATCH(I%)=0:NE
XT:ENDPROC
  210DEFPROCm:PROCh("Menu"):PRINT'CHR$130;SPC(8);"(1)
   Filename.":PRINTCHR$130;SPC(8);"(2)     Define Field
s.":PRINTCHR$130;SPC(8);"(3)     Load File.":PRINTCHR$1
30;SPC(8);"(4)     Save File.":PRINTCHR$130;SPC(8);"(5)
     Edit File."
  220PRINTCHR$130;SPC(8);"(6)     Sort.":PRINTCHR$130;S
PC(8);"(7)     Search.":PRINTCHR$130;SPC(8);"(8)     Dis
play File.":PRINTCHR$130;SPC(8);"(9)     Printer Dump."
:PRINTCHR$130;SPC(8);"(0)     Start Again.":REPEAT:IN$=
GET$:UNTIL IN$>="0" AND IN$<="9"
  230IFIN$="1"THENPROCf ELSEIFIN$="2"THENPROCdf ELSEIF
IN$="3"THENPROClo ELSEIFIN$="4"THENPROCsa ELSEIFIN$="5
"THENPROCed ELSEIFIN$="6"THENPROCso ELSEIFIN$="7"THENP
ROCse ELSEIFIN$="8"THENPROCdi ELSEIFIN$="9"THENPROCp E
LSEIFIN$="0"THENPROCst
  240PROCm
  250DEFPROCf:PROCh("Filename"):PRINTCHR$131;SPC(5);"F
ilename <";f$;TAB(26,3);">":IF f$="" THEN 260 ELSE 280
  260PROCi(16,3,10,"S")
  270f$=s$
  280PRINTTAB(0,6);CHR$131;"Do you wish to change the
filname (Y/N)":IN$=GET$:IF IN$="Y" THEN 260 ELSE ENDPR
OC
  290DEFPROCh(h$):CLS:PRINTTAB(16-(LEN(h$)/2),0);CHR$1
29;CHR$141;h$:PRINTTAB(16-(LEN(h$)/2),1);CHR$129;CHR$1
41;h$:PRINT:ENDPROC
  300DEFPROCdf:IFred>=1 THEN ENDPROC ELSE PROCh("defin
e_fields"):PRINTCHR$134;"Field";SPC(2);"Type";SPC(2);"
No. chrs";SPC(4);"Label":FOR I%=1 TO F:PRINTCHR$131;TA
B(2);I%-1;TAB(9);SI$(I%);TAB(16);no(I%);TAB(27);label$
(I%):NEXT
  310PRINTTAB(0,16);CHR$131;"Press (A) to edit all Fie
lds or (0_";F-1;")":PROCgb:PRINTTAB(2,15);CHR$133;"S=S
tring  I=Integer  N=Numeric."
  320IN$=GET$
  330IF IN$="A" OR IN$="a"THEN F1=1:F2=F:GOTO420
  340IF IN$=" " ENDPROC
  350F$=STR$(F-1)
  360IF IN$<"0" OR IN$>F$ THEN 380
  370 GOTO400
  380IF ASC(IN$)<>13 THEN PROCn
  390GOTO310
  400IF IN$="0" THEN F1=1:F2=1:GOTO420
  410F1=VAL(IN$)+1:F2=F1
  420head=1:FOR I%=F1 TO F2
  430PROCi(7,3+I%,1,"S")
  440IF s$="S" OR s$="I" OR s$="N" THEN SI$(I%)=s$ ELS
E PROCn:GOTO430
  450PROCi(14,3+I%,2,"I")
  460IF VAL(s$)>0 AND VAL(s$)<26 THEN no(I%)=VAL(s$) E
LSE PROCn:GOTO450
  470PROCi(27,3+I%,8,"S"):label$(I%)=s$:NEXT
  480 GOTO 330
  490DEFPROCi(X%,Y%,L%,t$)
  500I%=0:s$="":red1=1:VDU 23,1,1;0;0;0;
  510PRINTTAB(X%,Y%);STRING$(L%," ")+STRING$(L%,CHR$12
7);:GOTO 530
  520PROCn
  530IN$=GET$:in%=ASC(IN$):IF in%=13 THEN 670
  540IF in%=127 THEN 550 ELSE 560
  550X=POS:IF X>X% THEN PRINTIN$;:I%=I%-1:s$=LEFT$(s$,
I%):GOTO530 ELSE 520
  560IF I%=L% THEN 520
  570IF t$="S" THEN 620
  580IFt$="I" THEN 610
  590IF t$="N" THEN 600
  600IF in%>39 AND in%<63 OR in%=127 THEN630 ELSE 520
  610IF in%>47 AND in%<58 OR in%=127 THEN630 ELSE 520
  620IF in%>31 AND in%<128 THEN 630 ELSE520
  630s$=s$+IN$:I%=I%+1
  640PRINTIN$;:IF I%=L% THEN 530 ELSE 530
  650IF s$=" " THEN 520
  660I%=I%-1:s$=LEFT$(s$,I%):GOTO 640
  670VDU 23,1,0;0;0;0;:ENDPROC
  680DEFPROCn:SOUND1,-10,0,5:ENDPROC
  690DEFPROCso:IF red<1THEN PROCd:ENDPROC
  700PROCh("Sort"):PRINT'':FORM%=1TOF:PRINTCHR$132;SPC
(4);M%-1;CHR$134;label$(M%):NEXT:PRINTTAB(0,3);CHR$134
;"Field for sorting (0_";F-1;") :";CHR$132;
  710PROCi(27,3,1,"I"):IF s$="" THEN PROCn:GOTO710 ELS
E Field%=VAL(s$)+1:IF Field%>F THEN PROCn:GOTO710
  720PRINTTAB(27,3);Field%-1:PRINTTAB(20,5+Field%);CHR
$136;CHR$129;"SORTING":N%=R:D%=1
  730D%=2*D%
  740IFD%<N% THEN730
  750D%=D%-1
  760D%=D% DIV 2
  770IFD%=0 THEN880
  780I1%=N%-D%
  790FORI%=1 TOI1%
  800J%=I%
  810L%=J%+D%
  820IF SI$(Field%)="S" THEN 850
  830IF VAL(A$(Field%,L%))>VAL(A$(Field%,J%)) THEN PRO
Cs:J%=J%-D%:IFJ%>0 THEN810
```

(listing continued on page 113)

RS 232 & PARALLEL PRINTER INTERFACE for ZX SPECTRUM

Connect to professional printers with this improved and cheaper printer interface.

£34.95 cable £9.95 inc VAT

ZX Lprint III interface enables your ZX Spectrum computer (16 or 48K) to print on almost any dot matrix or daisywheel printer with RS 232 or Centronics input. Just plug in ZX Lprint III and LPRINT and LLIST commands will work. COPY works without any additional software on Seikosha 100 & 250, hi-res Epsons, Star 510, 515, STX 80 Gemini & Delta, Walters WM80, Shinwa and CTI...Plus Seikosha GP 700 in full colour. COPY on CGP115 and Microline is optional. And because NO additional software is needed all of your RAM is free to take Tasword 2 or Kemp Business Accounts, Viewfile etc.

- WORD PROCESSING
- HIGH RESOLUTION SCREEN DUMPS
- PRINTS SPECTRUM AND USER DEFINED GRAPHICS
- JUST PLUG IN FOR LPRINT LLIST and COPY
- COMPATIBLE WITH MICRODRIVES & PRESTEL ADAPTOR

EUROELECTRONICS

DEALER ENQUIRIES WELCOME

ORDER: To EUROLECTRONICS, 26 Clarence Square, Cheltenham. Glos. GL50 2JP Tel: (0684) 292448.

From: Name: __________

Address: __________

This order is for:	(Quantity)
ZX LPRINT III at £34.95	
Centronics Cable at £9.95	
RS 232 Cable at £9.95	
Tasword 2 at £13.90	

Please add £1.45 p&p

Cheques/PO payable to EUROELECTRONICS

Amount enclosed __________

Microdrives adaptor for ZX Lprint I and II £4.50 + 70p p&P

Miles Better Software

221 Cannock Road, Chadsmoor, Cannock Staffs WS11 2DD. Tel: (05435) 3577

U.S. Gold Software

	ZX CASS	CBM or ATARI CASS	CBM or ATARI DISC
Beach Head*	6.95	8.95	11.95
Raid on Moscow	6.95	8.95	11.95
Strip Poker	6.95	8.95	11.95
Forbidden Forest*		7.95	11.00
Aztec Challenge*		7.95	11.00
Slinky*		7.95	11.00
Caverns Khafka*		7.95	11.00
Pooyan		8.95	11.95
Bruce Lee*	5.95	8.95	12.95
Dallas Quest*			12.95
Snokie*		8.95	11.95
Flak*		8.95	12.95
Stellar 7		8.95	11.95
Mystic Mansion		7.95	11.00
Solo Flight*	3.95	12.95	12.95
Spitfire Ace*		8.95	11.95
F15-Eagle*	3.95	12.95	12.95
NATO Commander*		8.95	11.95
Indiana Jones		8.95	
Tapper	6.95	8.95	11.95
Congo Bongo	6.95	8.95	11.95
Up n Down	6.95	8.95	11.95
Spy Hunter	6.95	8.95	11.95
Buck Rogers	6.95	8.95	11.95
Knights Desert*		12.95	12.95
Combat Leader*		12.95	12.95
Battle Normandy*		12.95	12.95
Fort Apocalypse*	6.95	8.95	12.95
Drelbs*	6.95	8.95	12.95
Blue Max*	6.95	8.95	12.95
Sentinal		8.95	12.95
Zaxxon*	6.95	8.95	12.95

*Available for the Atari

Please phone for software availability and software lists for the 64 and Atari

ADD £1 for overseas orders. ACCESS/VISA

SINCLAIR, ATARI COMMODORE

COMPUTER REPAIRS by the SPECIALISTS

Walkers

COMPUTER SERVICE AND REPAIRS

Telephone (021) 643 5474
Telegrams Shiplag Birmingham
Telex 337124 TWSLOC G

WALKERS will repair your MICRO quickly and efficiently.

Services available to suit the Customers requirements include "one-off" repairs and Quotations.

Most Repairs will be in the range

£15 to £30

subject to machine

FOR INFORMATION

PHONE 021-643 5474

CALL IN AT

58 OXFORD STREET, BIRMINGHAM, B5 5NX

OR SEND S.A.E. FOR DETAILS

(continued from page 111)

many options, output may be directed to the printer or to the screen. Only Parallel printers have been catered for in this version of Superfile. Options are accessed through a menu.

The great beauty of the database is its user friendliness, so that even the youngest member of the family may easily exploit the system.

(1) Filename: To enter this option simply press 1 on the keyboard, and immediately the computer will ask you to enter a filename. A filename is the label given to your data when it is stored on cassette.

If you have previously entered a filename, then you will be asked about whether you wish to change it. Pressing Y will allow you to input up to 10 characters for the filename. Any other key will return the user to the menu enabling them to use the options. It must be noted, however, that a filename is required if you wish to enter the options of Load (3) and Save (4).

(2) Define fields: This is the most essential option of the database, it must be entered before any data can be inputted via the Edit option. This is basically because it defines areas in memory for information to be stored, and thus is the crux of the program.

There are three main items of data to be entered in each field, these are:

■ The type of data you wish to store in each field, ie., String variables — letters and numbers, integers — whole numbers — and numerics — real numbers.

■ The maximum number of characters allowed to be stored in each field — with a maximum of 25 characters per field.

■ The label given to each field which identifies the contents of the field when displayed. The maximum number of characters allowed is eight.

To enter these important pieces of data you can either press the relevant field number or press A to 'enter every field.' At any time pressing the space bar will return the user to the menu.

(3) Load: This option loads the previously stored data into the computer so that it may be processed. It is essential to input the correct number of fields for the file you wish to load, otherwise the computer will not accept the file, and the user will be informed. In this case, a message is displayed that tells the user to start again via option 0, and redefine the fields to the correct value if you wish to load this particular file.

To actually enter a file, the user must press L and then the usual searching message is displayed on the screen. The normal procedure for loading a program is then observed — refer to User Guide if unsure.

When the file has been loaded, pressing the space bar will return the user to the menu.

(4) Save: Both options Load (3) and Save (4) need to have a filename entered, before you can access them, if not the 'No Filename' message will be displayed with instructions for the appropriate actions to take.

This Save option obviously stores the data on tape, and is operated by pressing S on the keyboard. After this, the "Record then Return" message is displayed, at which point a cassette must be inserted into the tape recorder. The usual procedure for saving programs is then followed.

As with most options in this database, pressing the space bar will return the user to the menu.

(continued on next page)

(listing continued from page 115)

```
 040GOTO060
 850IFA$(Field%,L%)>A$(Field%,J%) THEN PROCs:J%=J%-E%
:IFJ%>0 THEN810
 860NEXT
 870GOTO760
 880PROCg
 890PRINTTAB(20,5+Field%);CHR$130;" SORTED ":PROCr:EN
DPROC
 900DEFPROCed:PROCh("Edit"):IF head=0 THEN PROCnh:END
PROC
 910r=INT(r):PRINTTAB(34,2);"    ":PRINTTAB(0,2);CHR$
131;"(N) for next record.";CHR$130;" (R)-RECORD:";r
 920IF r>R THEN PROCn:r=R:GOTO910
 930 IFr<1 THEN r=1:GOTO910
 940FORI%=1TOF:PRINTTAB(0,3+I%);CHR$131;I%-1;CHR$134;
label$(I%);TAB(11,3+I%);CHR$131;"<";STRING$(25," ")+ST
RING$(25,CHR$127);A$(I%,r);TAB(13+no(I%),3+I%);">":NEX
T
 950PRINTTAB(4,15);CHR$131;"(E) to erase current reco
rd":PROCgb:PRINTTAB(2,16);CHR$131;"(A) to edit all fie
lds or (0_";F-1;")."
 960IN$=GET$
 970IFIN$="N" OR IN$="n" THEN r=r+1:GOTO910
 980IFIN$="R" OR IN$="r" THEN PROCi(34,2,4,"I"):r=VAL
(s$):GOTO910
 990IFIN$="A" OR IN$="a"THENF1=1:F2=F:GOTO1100
1000IF IN$="E" OR IN$="e" THEN 1010 ELSE 1020
1010FORI%=1 TO F:A$(I%,r)="":NEXT:MATCH(r)=0:GOTO940
1020IFIN$=" "THENENDPROC
1030F$=STR$(F-1)
1040IFIN$<"0"ORIN$>F$THEN1060
1050GOTO1080
1060IFASC(IN$)<>13THENPROCn
1070GOTO960
1080IFIN$="0"THENF1=1:F2=1:GOTO1100
1090F1=VAL(IN$)+1:F2=F1
1100FORI%=F1 TOF2:IF FNmem<200 THEN PROCnm:ENDPROC EL
SE PROCi(13,3+I%,no(I%),SI$(I%)):A$(I%,r)=s$
1110IF ASC(s$)=-1 THEN 1120 ELSE red=1:MATCH(r)=2
1120NEXT
1130GOTO940
1140DEFPROCnh:PROCh("Fields Undefined"):PROCn:PRINTCH
R$129;"  You have not defined the fields.":PRINTCHR$12
9;SPC(5);"Please do so via option (2).":PRINT:PROCr:EN
DPROC
1150DEFPROCst:PROCh("Check"):PRINTCHR$129;SPC(8);"Are
 you sure (Y/N)?":IN$=GET$:IF IN$="N" THEN ENDPROC ELS
E CLEAR:GOTO70:ENDPROC
1160DEFPROCnf:PROCh("Filename Undefined"):PROCn:PRINT
CHR$129;"  You have not defined a filename.":PRINTCHR$
129;SPC(5);"Please do so via option (1).":PROCr:ENDPRO
C
1170DEFPROCsa:IF red<1 THEN PROCd:ENDPROC ELSE IF f$=
"" THEN PROCnf:ENDPROC ELSE PROCh("Save"):PRINTCHR$133
;SPC(5);" Press (S) to save the data.":PROCgb
1180IN$=GET$:IF IN$="S" THEN 1190 ELSE IF IN$=" " THE
N ENDPROC ELSE 1180
1190VDU28,5,12,25,8:Z%=OPENOUT (f$):PRINT#Z%,F,R:FOR
I%=1 TO F:PRINT#Z%,SI$(I%),no(I%),label$(I%):NEXT:FOR
I%=1 TO R:PRINT#Z%,MATCH(I%):FOR N%=1 TO F:PRINT#Z%,A$
(N%,I%):NEXT N%,I%:CLOSE#Z%:VDU28,0,21,39,3:PROCr:ENDP
ROC
1200DEFPROCdi:IF red<1 THEN PROCd:ENDPROC ELSE PROCh(
"Display"):PRINTCHR$130;SPC(2);"Press <RETURN> to view
 each file.":VDU28,1,17,38,7:PROCps:VDU28,0,21,39,3:PR
OCr:ENDPROC
1210DEFPROCps:IF SE=1 THEN SE1=2 ELSE SE1=1
1220FOR I%=1 TO R:IF MATCH(I%)=0 OR MATCH(I%)=SE1 THE
N 1300
1230IF MATCH(I%)=0 OR MATCH(I%)=SE1 THEN 1300
1240IN$=GET$:IF ASC(IN$)=13 OR ASC(IN$)=32 THEN 1250
ELSE PROCn:GOTO 1240
1250IF ASC(IN$)=13 THEN CLS ELSE ENDPROC
1260PRINT'CHR$129;"Record:";I%
1270FOR N%=1 TO F
1280PRINTCHR$133;label$(N%);TAB(10);":";CHR$131;A$(N%
,I%)
1290NEXT N%
1300NEXT I%
1310PROCtot:ENDPROC
1320DEFPROCr:PRINTTAB(0,17);CHR$131;"  Press <SPACE>
To return to";CHR$129;"MENU."
1330IN$=GET$:IF IN$=" " THEN ENDPROC ELSE 1330
1340DEFPROCgb:PRINTTAB(0,17);CHR$131;"  Press <SPACE>
To return to";CHR$129;"MENU.":ENDPROC
1350DEFPROClo:IF f$="" THEN PROCnf:ENDPROC ELSE PROCh
("Load"):PRINTCHR$133;SPC(5);"Press (L) to load new fi
le.":PROCgb
1360IN$=GET$:IF IN$=" " THEN ENDPROC
1370IF IN$="L" OR IN$="l" THEN 1380 ELSE PROCn:GOTO13
60
1380PROCc:VDU28,5,12,25,8:Z%=OPENIN (f$):INPUT#Z%,F4,
R4:PROCck:IF F4<>F THEN ENDPROC
1390FOR I%=1 TO F
1400INPUT#Z%,SI$(I%),no(I%),label$(I%)
1410NEXT
1420FOR I%=1 TO R
1430INPUT#Z%,MATCH(I%)
1440FOR N%=1 TO F
1450INPUT#Z%,A$(N%,I%)
1460NEXT N%,I%
1470CLOSE#Z%
1480VDU28,0,21,39,3
1490red=1:head=1
1500PROCr:ENDPROC
1510DEFPROCck:IF F4=F THEN ENDPROC ELSE VDU28,0,21,39
,3:PROCh("Mismatch"):PRINTCHR$130;"If you wish to acce
ss this file then":PRINTCHR$130;"you must redefine the
 no. of fields to":PRINTCHR$130;"be :";CHR$133;F4;CHR$
130;"only.This will give you :";
1520PRINTCHR$133;R4:PRINTCHR$130;"records and will be
 compatible with":PRINTCHR$130;"the file you wish to l
oad.Please do so":PRINTCHR$130;"via option (0).":PROCr
:ENDPROC
1530DEFPROCc:FORX%=1 TO F:FORJ%=1 TO R:A$(X%,J%)="":N
EXTJ%,X%:ENDPROC
1540DEFPROCp:IF red<1 THEN PROCd:ENDPROC ELSE PROCh("
Printer_dump")
1550*FX5,1
1560*FX6,0
```

(listing continued on next page)

(continued from previous page)

(5) Edit file: The fifth option in the menu is the edit procedure which allows the altering and adding of data to the file. All data is initially entered via this option.

Once the user has accessed this section of the system, the fields defined will be displayed followed by the space provided for the number of characters as defined in option 2 for the field. Altering data in a particular field may be achieved by typing the field number allowing data to be entered in the space provided.

Alternatively, the whole record can be entered by pressing A. Erasing a whole record may be achieved by pressing E. To access the next record simply press N or if you wish to edit a particular record press R followed by the record number and Return. Again the space bar will return you to the menu.

(6) Sort: The sort option enables the user to put the file in order according to any of the fields defined in option 2.

If the field has been defined as numeric or integer then the order will be of the algebraic nature, otherwise the file will be ordered according to character values.

Using the sort option requires only one entry; the user must choose the field on which the sort is to be based. Once the sorting is complete the user will be able to return to the menu in the normal way.

(7) Search: This is probably the most useful facility of any database. However, Superfile has a remarkably efficient and rapid search that is enhanced by its special mixture of machine code and hybrid Basic.

Search criteria used are the widely accepted mathematical in-equalities — these are as follows:

1 > : greater than.
2 < : less than.
3 = : equal to.
4 > = : greater than and equal to.
5 < = : less than and equal to.
6 < > : not equal to.

For the "equal to" sign, the user may enter part of a string/number, and then the computer will search for all occurrences of the comparison. Only one search criteria may be entered per field, but many fields can have comparisons thus performing a multisearch function.

The number of items that the computer has found which satisfy the conditions defined is printed on the screen as they are found. These records can then be seen either on the screen or in the form of a printout on the printer. Screen and printer output are explained in options 8 and 9.

(8) Display: This option is used to print the records on the screen, these may only be displayed if they contain data. Pressing Return will allow you to view the next record. When all records have been displayed, the totals of the numbers stored in the integer and numeric fields will also be printed up.

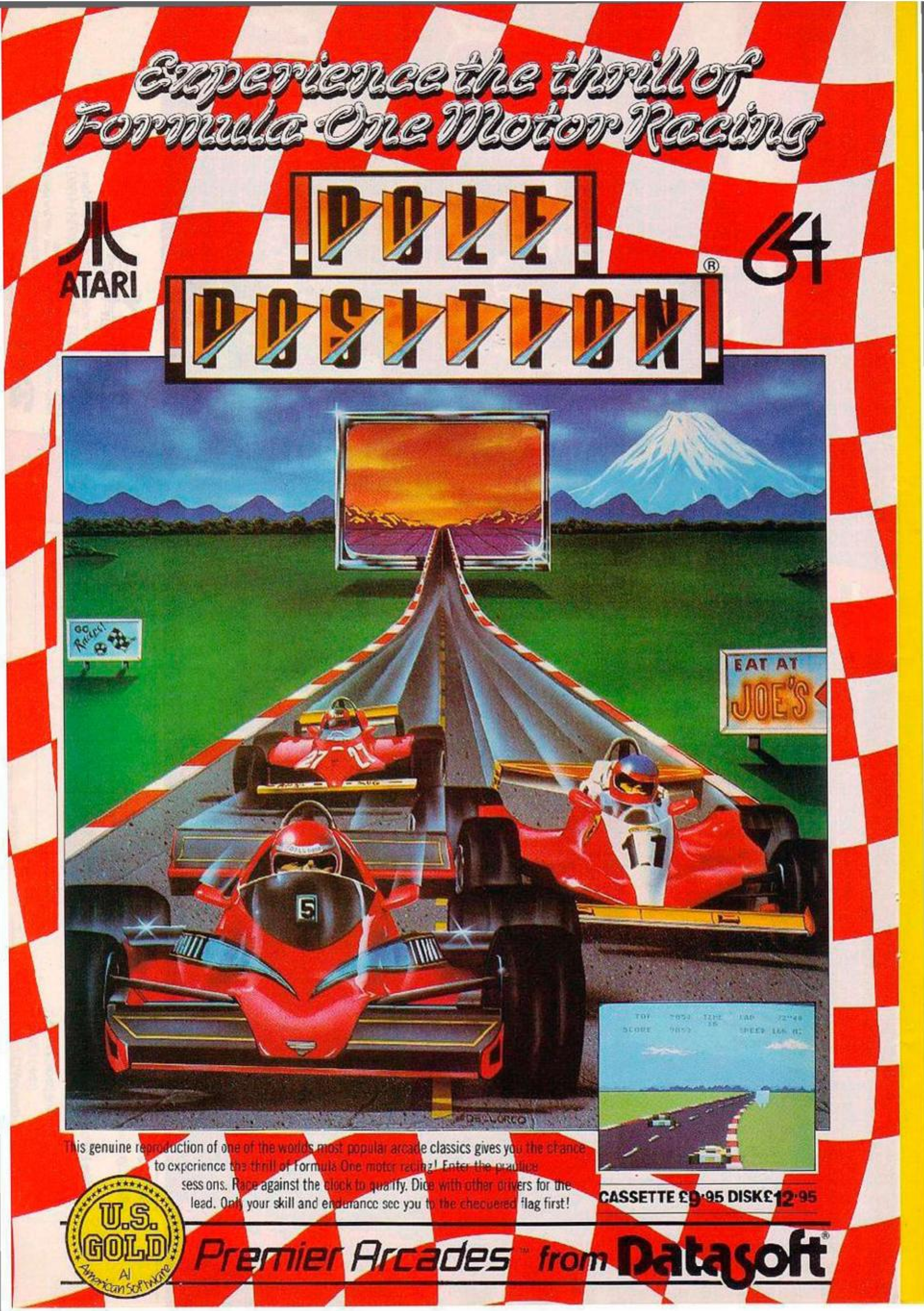
(9) Printer dump: As explained earlier, this version of Superfile can only cater for Parallel printers. We advise that you only use this option if you have a printer connected, otherwise the computer may appear to have crashed.

(0) Start again: This option is used if the user decides to change the format of the file, or if he just wishes to clear the memory. The computer asks you whether you wish to change your mind, just as a precaution before the computer clears the entire memory. ■

(listing continued from previous page)

```
 1570PRINTCHR$131;" Press <RETURN> tc view each record
":PROCgo:VDU28,0,19,39,7:CLS:VDU2
 1580 IF SE=1 THEN SE1=2 ELSE SE1=1
 1590FORI%=1 TO R
 1600IF MATCH(I%)=0 OR MATCH(I%)=SE1 THEN 1650
 1610IN$=GET$:IF IN$=" " OR ASC(IN$)=13 THEN 1620 ELSE
 PROCn:GOTO1610
 1620IF IN$=" " THEN VDU3:VDU28,0,21,39,3:ENDPROC
 1630PRINTCHR$129;"Record:";CHR$133;I%:FORN%=1 TO F:PR
INTCHR$129;label$(N%);TAB(9);CHR$133;":";A$(N%,I%):NEX
TN%
 1640PRINT
 1650NEXTI%
 1660PROCtot:VDU3:VDU28,0,21,39,3:PROCr:ENDPROC
 1670DEFPROCse:IF rec<1 THEN PROCd:ENDPROC ELSE PROCh(
"Search"):SE=1:PRINTTAB(0,2);CHR$130;"Field";TAB(8,2);
"Equality";TAB(20,2);"Comparison"
 1680FORX%=1 TO F
 1690PRINTTAB(0,3+X%);CHR$134;label$(X%);CHR$132;:PRIN
TTAB(12,3+X%);CHR$134;"<";SPC(no(X%));">"
 1700NEXT
 1710FORX%=1 TO F
 1720Value=0
 1730PROCi(10,3+X%,2,"S")
 1740IF s$="" THEN 1810
 1750IF s$="<" THEN Value=1 ELSE IF s$=">" THEN Value=
2 ELSE IF s$="=" THEN Value=3 ELSE IF s$="<>" THEN Val
ue=4 ELSE IF s$="<=" THEN Value=5 ELSE IF s$=">=" THEN
 Value=6 ELSE PROCn:GOTO1730
 1760IF SI$(X%)="N" OR SI$(X%)="I" THEN Value=Value+6
 1770AL(X%)=Value
 1780PROCi(14,3+X%,no(X%),SI$(X%))
 1790IF s$="" THEN PROCn:GOTO1780
 1800ITEM$(X%)=s$
 1810NEXT
 1820F1=0
 1830FORX%=1 TO F:IF AL(X%)>=1 THEN F1=1
 1840NEXT
 1850IFF1=1 THEN1880
 1860PROCn:PRINTTAB(0,15);CHR$129;"You cannot search f
or any items as you":PRINTCHR$129;" have not defined a
ny comparisons."
 1870PROCr:GOTO2180
 1880PRINTTAB(3,15);CHR$133;"Are you happy with this (
Y/N)?"
 1890IN$=GET$:IF IN$="N"THEN PRINTTAB(3,15);SPC(35);:F
ORI%=1 TO F:AL(I%)=0:NEXT: GOTO 1670 ELSE IF IN$="Y" T
HEN GOTO 1900 ELSE GOTO 1890
 1900CLS:T=0:FAIL=0:PRINTTAB(12,6);CHR$129;CHR$141;"MA
TCHED ";T:PRINTTAB(12,7);CHR$129;CHR$141;"MATCHED ";T
 1910FORX%=1 TO R
 1920IF MATCH(X%)=0 THEN 211K
 1930FORJ%=1 TO F
 1940IF AL(J%)=0 THEN 2070
 1950ON AL(J%) GOTO 1960,1980,2000,2010,2030,2050,1970
,1990,2000,2020,2040,2050
 1960IF A$(J%,X%)<ITEM$(J%) THEN 2070 ELSE FAIL=1:GOTO
2070
 1970IF VAL(A$(J%,X%))<VAL(ITEM$(J%)) THEN 2070 ELSE F
AIL=1:GOTO2070
 1980IF A$(J%,X%)>ITEM$(J%) THEN 2070 ELSE FAIL=1:GOTO
2070
 1990IF VAL(A$(J%,X%))>VAL(ITEM$(J%)) THEN 2070 ELSE F
AIL=1:GOTO2070
 2000Z=INSTR(A$(J%,X%),ITEM$(J%)):IF Z<>0 THEN2070 ELS
E FAIL=1:GOTO2070
 2010IF A$(J%,X%)<>ITEM$(J%) THEN 2070 ELSE FAIL=1:GOT
O2070
 2020IF VAL(A$(J%,X%))<>VAL(ITEM$(J%)) THEN 2070 ELSE
FAIL=1:GOTO2070
 2030IF A$(J%,X%)<=ITEM$(J%) THEN 2070 ELSE FAIL=1:GOT
O 2070
 2040IF VAL(A$(J%,X%))<=VAL(ITEM$(J%)) THEN 2070 ELSE
FAIL=1:GOTO2070
 2050IF A$(J%,X%)>=ITEM$(J%) THEN 2070 ELSE FAIL=1:GOT
O2070
 2060IF VAL(A$(J%,X%))>=VAL(ITEM$(J%)) THEN 2070 ELSE
FAIL=1:GOTO2070
 2070NEXTJ%
 2080IF FAIL=1 THEN FAIL=0:GOTO 2:10
 2090MATCH(X%)=1
 2100T=T+1:PRINTTAB(22,6);T:PRINTTAB(22,7);T
 2110NEXT(%
 2120PRINTTAB(2,17);CHR$133;"Printer or screen output
(P/S)?"
 2130IN$=GET$:IF IN$="P" OR IN$="S" THEN2140 ELSE GOTO
 2130
 2140 IF IN$="P" THEN PROCp ELSE PROCdi
 2150FOR I%=1 TO R
 2160IF MATCH(I%)>=1 THEN MATCH(I%)=2
 2170NEXT
 2180SE=0:FORI%=1TOF:AL(I%)=0:ITEM$(I%)="":NEXT
 2190ENDPROC
 2200DEFPROCd:PROCn:PROCh("No_Data"):PRINTCHR$129;"You
 can't enter this option before you":PRINTCHR$129;"hav
e inputted any data. Please do so":PRINTCHR$129;"via o
ption (5).":PROCr:ENDPROC
 2210DEFPROCs:m=MATCH(L%):MATCH(L%)=MATCH(J%):MATCH(J%
)=m:FORK%=1 TO F:S$=A$(K%,J%):A$(K%,J%)=A$(K%,L%):A$(K
%,L%)=S$:NEXT:ENDPROC
 2220DEFPROCg:X%=0:REPEAT:X%=X%+1:UNTIL MATCH(X%)<>2:Y
%=X%-1:FOR K%=1 TO (Y% DIV 2):FOR J%=1 TO F:S$=A$(J%,K
%):A$(J%,K%)=A$(J%,Y%-K%+1):A$(J%,Y%-K%+1)=S$:NEXT J%,
K%:ENDPROC
 2230DEFPROCtot:FOR I%=1 TO F:tot(I%)=0:NEXT I%:IF SE=
1 THEN SE1=2 ELSE SE1=1
 2240FOR X%=1 TO R
 2250IF MATCH(X%)=0 OR MATCH(X%)=SE1 THEN 2290
 2260FOR J%=1 TO F
 2270IF SI$(J%)<>"S" THEN tot(J%)=tot(J%)+VAL(A$(J%,X%
)) ELSE 2280
 2280NEXT J%
 2290NEXTX%
 2300CLS:PRINT:PRINTCHR$129;"TOTALS":FOR I%=1 TO F:PRI
NTCHR$133;label$(I%);TAB(11);":";CHR$131;:PROCdec:NEXT
:ENDPROC
 2310DEFFNmem DIM P%-1:=HIMEM -P%
 2320DEFPROCm:PROCh("Low Memory"):PROCn:PRINTCHR$129;
"Unfortunately you are close to the ":PRINTCHR$129;"me
mory limit. Please save file now.":ENDPROC
 2330DEFPROCdec:IF SI$(I%)="S"THEN PRINTCHR$129"N/A":E
NDPROC ELSE PRINTtot(I%):ENDPROC
>
```

BASIC LIGHTNING
WHITE LIGHTNING
MACHINE LIGHTNING
LIGHTNING STRIKES AGAIN
OASIS SOFTWARE
THREE HIGH POWERED GRAPHICS DEVELOPMENT SYSTEMS FOR THE COMMODORE 64.
Totally dedicated to writing very fast, video games, BASIC Lightning is a fully structured extension to the Commodore BASIC which adds a staggering 200 reserved words. It allows up to five tasks to run concurrently (one in foreground and four in background). Most of the commands are dedicated to games writing and the sound and graphics commands are unparalleled. Procedures and PASCAL type structured programming commands are also a feature of BASIC Lightning.
As well as the Commodore's own 8 hardware sprites, BASIC Lightning has its own software sprites. Up to 255 can be defined with user selectable dimensions. These can even be several screens wide. They can be scrolled, spun, mirrored, enlarged or inverted with phenomenal speed and smoothness.
A Sprite Generator Program (written in BASIC Lightning) is also supplied and can be used to design, edit and store all your sprites for use in your main program.
White Lightning is a complete games writing package comprising a high level, Forth based, multi-tasking games writing language, the extended BASIC (see BASIC LIGHTNING) and a powerful Sprite Generator Program. Programs can even be written in a combination of Forth and Commodore BASIC and the final program, which will run independently of White Lightning, can be marketed with no restrictions whatsoever.
The Basic Lightning part of the package can be used to experiment quickly and easily before the Forth program is developed.
The speed of White Lightning has to be seen to be believed and a full demo is included. As with Basic Lightning, hardware sprites are supported, together with 255 software sprites which can be scrolled, spun, reflected, enlarged or inverted.
MULTI-TASKING Without doubt the most powerful feature of the Lightning series of languages is the multi-tasking facility. This allows two programs to be run concurrently and makes those smooth landscape scrolls etc effortless.
The BASIC Lightning Sprite Generator Program is also included in the package.
Commodore 64 Machine Lightning is probably the most advanced games writing utility available on any micro. It comes in 4 parts:
MACRO ASSEMBLER/MONITOR/DISASSEMBLER This is probably the most comprehensive machine code development system available for the Commodore 64 with features too numerous to mention.
BASIC LIGHTNING BASIC Lightning, the multi-tasking BASIC is also provided to facilitate experimentation in preparation for later assembly.
SPRITE GENERATOR Used to develop all the graphics for the final game. The Sprite Generator has numerous functions including enlargement, rotation and reflection.
OBJECT LIBRARY This is Machine Lightning's most powerful feature. 10k of re-entrant code with more than 130 documented entry points. These are the routines that provide all the superfast graphics routines in White and Basic Lightning. They contain virtually every routine you'll ever need to write an Arcade Game and multi-tasking in Machine Lightning is covered in the comprehensive accompanying manual.
AVAILABLE ON TAPE OR DISK
Available from Boots and all good software suppliers
OASIS SOFTWARE
9a Alexandra Parade, Weston-super-Mare, Avon BS23 1QT Telephone: (0934) 419921.
Every product carries a lifetime guarantee.
All prices include comprehensive manuals, VAT and p&p.
(includes manuals and p&p overseas)
24-hour Access
Tele ordering on (0934) 419921
Please send me the following Lightning System Pack(s)
Basic Lightning (tape) £14.95
(disk) £19.95
White Lightning (tape) £19.95
(disk) £29.95
Machine Lightning (tape) £29.95
(disk) £39.95
I enclose my cheque/PO. for £
Name
Address
Telephone
CYC


Experience the thrill of Formula One Motor Racing
POLE POSITION
ATARI
64
EAT AT JOE'S
This genuine reproduction of one of the worlds most popular arcade classics gives you the chance to experience the thrill of Formula One motor racing! Enter the practice sessions. Race against the clock to qualify. Dice with other drivers for the lead. Only your skill and endurance see you to the chequered flag first!
CASSETTE £9·95 DISK £12·95
U.S. GOLD
All American Software
Premier Arcades™ from Datasoft®

TUTORIAL

Phil Holliday continues his course on assembly language.

LAST MONTH I covered the programming model of the 68008 and its addressing modes. A brief introduction to the instruction set was made and this will be expanded in this article, together with a more complex program example than the one given last month.

I will describe the instruction set under eight general headings, namely data movement, arithmetic, shift and rotate, bit manipulation, binary coded decimal, program control and system control.

The basic Move instruction was covered last month. It has several variants. Move multiple registers — MoveM — allows several registers to be moved to or loaded from memory in one instruction. Move quick — MoveQ — allows an eight bit signed number — i.e. from −128 to +127 — to be sign extended and loaded to a data register.

It is called "quick" as the whole instruction, including the number, is only one word — i.e. two bytes — long. Note there are other quick instructions in the 68008 instruction set.

Move peripheral data — MoveP — transfers data between a data register and alternate bytes of memory, and is intended to simplify the transfer of data between the 68008 and 8 bit peripheral devices. I have not found this a very useful instruction for the QL so far.

Load effective address — LEA — allows an effective address to be computed and stored in an address register. This is a much used instruction and an example will help. Suppose we have opened a channel using a QDOS system call and stored the channel ident returned by the call in a long variable labelled channel. Then to actually load the channel ident into address register a0 we will need a fragment of code such as:

```
LEA channel, a0
MOVE.L (a0),a0
```

Push effective address — PEA — computes an effective address in a similar way to the LEA instruction, but pushes it onto the stack rather than storing it in an address register.

Exchange registers — EXG — exchanges the contents of any register with any other register. Note that the whole 32 bit contents of each register is exchanged.

Link stack — Link — and unlink stack — UNLK — are related instructions. Link causes the current contents of an address register to be pushed onto the stack. The address register is then loaded with the updated contents of the stack pointer and a sign-extended displacement, which is a part of the instruction, is then added to the stack pointer.

This can be used to create a stack frame in which would be stored local data etc, as used in high level languages. UNLK restores the stack and appropriate address register to its state before a Link was executed by loading the stack pointer from the address register and then loading the address register from the top of the stack.

The ADD instruction adds the contents of the destination effective address to the contents of the source effective address and the result is stored in the destination effective address. The addition is binary. As an example suppose that data register d0 contains $100 — i.e. decimal 256 — and that address register a0 points to a variable which contains $200. Then the fragment of code

```
ADD.W (a0),d0
```

will store the result which is $300 in d0. There are several variations on this instruction which are applicable to many other of the arithmetic instructions.

First, we can have Add.B, Add.W and Add.L producing byte, word and long results respectively. Either the destination or the source must be a data register — i.e. it is not possible to add the contents of two memory locations together without first moving one of them into a data register — but see AddX below.

The add address — AddA — instruction is similar to the Add instruction but the destination must be an address register — and so size byte is not allowed. Add immediate — AddI — specifies the source as immediate data, and add quick — AddQ — provides a "quick" immediate add of from 1 to 8.

Add extended — AddX — performs an add of source and destination and the extend bit. It has two versions, either add register to register or add memory to memory.

The extend bit, when affected, is set to the same as the carry bit. It is unaffected by data movement instruction. Note that this allows multiple precision arithmetic.

The subtract instruction — Sub — and all its related instructions, i.e. SubA, SubI, SubQ and SubX work in exactly the same way as their equivalent Add instructions except that the source is subtracted from the destination — and in the case of SubX the extend bit is also subtracted.

Multiplication of two 16 bit numbers to produce a 32 bit result can be either unsigned — MulU — or signed — MulS. One of the multiplicands must be in a data register and the result will be placed in this same data register.

Similarly there are two divide instructions — DivS and DivU — which divide a 32 bit number in a data register by a 16 bit number. The result is a 16 bit quotient in the lower word of the data register and a 16 bit remainder in the upper word of the data register.

The compare — CMP — instruction performs a subtraction of the source from the destination, and sets the condition codes accordingly but does not change the destination. There are also similar compare address — CMPA — compare immediate — CMPI — and compare memory — CMPM — instructions.

Negate — Neg — subtracts the operand from 0 using 2's complement arithmetic. There is also a variation of this instruction using the extend bit (NEGX) for multiprecision arithmetic.

The clear instruction (CLR) clears, i.e. stores zero in, the operand. Note that, as with most instructions in the 68008 instruction set, this instruction does not work with all effective addressing modes. In particular it is not possible to CLR and address register. It is

(continued on next page)

(continued from previous page)

often necessary to clear address register a6 as some QDOS system calls require addresses in other registers relative to a6. To do this you can instead use the instruction

SUBA a6,a6

The sign extend instruction — Ext — will sign extend a byte to a word or a word to a long number. Effectively, this means that for a byte to word extend bit 7 will be copied into bits 8 through 15, and similarly for a word to long extend bit 15 will be copied into bits 16 through 31.

The test instruction — TST — compares the operand with zero and sets the appropriate flags. The test and set instruction — TAS — tests the byte operand setting the flags accordingly, and the most significant bit — bit 7 — of the operand is set.

This instruction would normally be used in a multi-processor system for synchronisation of several processors, which does not apply to the QL of course.

The standard logical operations of bitwise and — And — inclusive or — Or — exclusive or — EOr — and invert — Not — are available for byte, word and long size of data. Either the source or the destination must be a data register. There is also a set of immediate instructions, i.e. AndI, OrI and EorI.

Shift and rotate instructions have both right and left versions. There are arithmetic shift — ASL and ASR — and logical shift — LSR and LSL — instructions. ASL and LSL are identical, causing a zero to be shifted into the right hand side as the left shift takes place.

ASR causes the most significant bit to be retained as a right shift takes place, with the least significant bit falling off the end. The LSR instruction is similar, but a zero is shifted in at the left hand end.

The number of bits to be shifted can be specified as either immediate data in the range 1 to 8 bits, or else in a data register in the range 0 to 63 bits.

The rotate instructions have both right and left versions without extend — ROL and ROR — and with extend — ROXL and ROXR. In a rotate instruction the bit which would "fall" off the end is fed back into the opposite end of the register, and also into the carry bit. In the extend version both the carry and the extend bits are affected.

Four extremely useful bit instructions are available on the 68008. The bit to be manipulated can be specified as either immediate data or as a number held in a data register.

The bit test — BTST — instruction tests the state of a specified bit in a register or memory location and reflects it in the zero flag. The bit tested is not modified.

The bit test and set — Bset — instruction tests and reflects the state of the bit in the zero flag and sets the bit to a one.

The bit test and clear — BCLR — tests the bit as in Bset but resets the bit to zero.

Finally, the bit test and change — BCHG — tests the bit and then inverts it.

Three instructions are included which operate on byte sized operands and perform BCD arithmetic. The add decimal with extend instruction — ABCD — adds the source operand and destination operand and extend bit together using BCD arithmetic, placing the result in the destination operand and if necessary setting the extend bit to allow multi-precision BCD arithmetic.

The operands must either both be contained in data registers, or else in memory locations addressed indirectly through address registers. In the case of memory to memory addition only the predecrement addressing mode is available, to facilitate multi-precision addition.

The subtract decimal with extend instruction — SBCD — subtracts the source operand and extend bit from the destination operand using BCD arithmetic. The addressing modes are the same as for the ABCD instruction.

The negate decimal with extend instruction — NBCD — subtracts the destination operand, which is of size byte, and the extend bit, from zero placing the result in the destination. Thus the instruction produces the ten's complement of a BCD number if the extend bit is reset and the nine's complement otherwise.

This month's program example produces a directory of the cartridge in microdrive one and lists the number of sectors taken by each file, something which is not provided for in the normal QL DIR command. I have kept the program down to a reasonable length so as not to obscure the structure unduly. It is quite a simple matter to extend this simple program to give other features such as directory of other drives, selective listing of groups of files etc.

The parts of the record we are interested in are the file length, which is a long word and is located at the start of the record, and the name of the file which is stored in normal QL string format with the name length stored as a word at bytes 14 and 15 from the start of the record, and the actual name which starts at byte 16.

The program starts by opening channels first to the directory itself and then to the screen, which is the channel used for output, by using the QDOS io-open system call. The cartridge name and count of empty/good sectors is then fetched with QDOS filing system trap fs-mdinf and these details printed. The program then enters a loop.

Within this loop a check is made for the end of file marker from the directory with QDOS call io-pend, exiting if it is found as we have now read the whole directory. If end of file not found the next record is read into a 64 byte buffer. We now test to see if the file length or name length are zero, as if they are it indicates that this is an old file which has been deleted — in this case we branch back to the start of the loop.

If we have a genuine file record we calculate the number of sectors from its length and print the sector count as a decimal number using a QDOS utility call ut-mint. We now move the print position to column four with QDOS screen driver call sd-tab and print the name string using QDOS io call io-sstrg. Finally we send a line feed character to the screen with QDOS io call io-sbyte, and then branch to the top of the loop again.

```
 LOC     OBJECT      STMT   SOURCE STATEMENT
                       2
                       3 *Assembed using METACOMCO assembler
                       4
   =0105               5 mt_frjob  equ $105
   =0118               6 mt_alchp  equ $118
   =0201               7 io_open   equ $201
   =0303               8 io_fstrg  equ $303
   =0305               9 io_sbyte  equ $305
   =0307              10 io_sstrg  equ $307
   =0308              11 io_pend   equ $308
   =0311              12 sd_tab    equ $311
   =0345              13 fs_mdinf  equ $345
   =0347              14 fs_headr  equ $347
                      15
   =00CE              16 ut_mint   equ $CE
                      17
   =000A              18 lf        equ $0A
   =FFFF              19 this_job  equ -1
   =FFFF              20 inf       equ -1
                      21
                      22 QDOS      macro
                      23           moveq #\1&$FF,d0
                      24           trap  #\1/$100
                      25           tst.l d0
                      26           endm
                      27
                      28 VECTOR    macro
                      29           move.w \1,\2
                      30           jsr (\2)
                      31           tst.l d0
                      32           endm
                      33
                      34
                      35 *main routine
                      36
                      37 *open MDV1_
                      38
 0000'   72FF         39 start     moveq #this_job,d1
 0002'   7604         40           moveq #4,d3         1=dir
 0004'   41FA 0122    41           lea dir_name,a0     point to mdv1
                      42           QDOS io_open
 0008'   7001         42+          moveq #io_open&$FF,d0
 000A'   4E42         42+          trap  #io_open/$100
 000C'   4A80         42+          tst.l d0
 000E'   6600 0104    43           bne err_exit
                      44
                      45 *now save mdv1_ channel id in a4
                      46
 0012'   2848         47           movea.l a0,a4
                      48
                      49 *now open scr_ channel
                      50
 0014'   72FF         51           moveq #this_job,d1
```

(listing continued on page 121)

Write programs to unlock the multitasking power of your QL!
*Use Metacomco's much acclaimed **QL Development Kits** to create the software you need: Use **Assembler** for its speed, and for access to the QL's many features; use **BCPL** for systems programming; writing games, utilities, and applications packages; use **LISP** for manipulating data structures, and for exploring the world of artificial intelligence.*

RELEASE THE POWER OF THE QL

ASSEMBLER £39.95 INC. VAT + P&P

> Standard Motorola 68000 mnemonics.
> English error messages.
> Produces code which can be EXECed, and run as a concurrent job.
> External references allow linkage to high level languages.
> Integral linker allows assembler programs to be linked together.
> Macro expansions.
> Position independent, absolute or relocatable code can be produced.
> Conditional assembly.
> Large range of directives.
> Fully formatted listings.
> 30 character variable names and 32-bit values.

ENHANCED! NOW INCLUDES ASSEMBLER LINKER* AND NEW LOW PRICE £39.95

BCPL £59.95 INC. VAT + P&P

> True compiler.
> Multiple BCPL programs can run concurrently.
> Full runtime library includes interfaces to QDOS graphics, file operations, window handling, etc.
> Exception handling provides diagnostics for debugging.
> Link loader allows linkage of separately compiled segments.
> Assembler and BCPL modules can be linked together.
> 32-bit variables use the full QL address space.

LISP £59.95 INC. VAT + P&P

> Full support of QL features including window graphics, and screen handling.
> Compatible with Acornsoft Lisp for the BBC micro.
> Interpreter.
> Turtle graphics.
> Structure editor allows alteration of data structures.
> Prettyprinter displays programs in structured format.
> Tracer to aid in debugging.
> Garbage collector automatically recovers spare memory space.
> 28-bit integers and 250-character names.

Each language is supplied as a complete Development Kit which includes the software (on a Microdrive Cartridge), Metacomco's popular full screen editor, and user manual.

The QL Development Kits are available from HMV, Menzies and many other leading retailers, or direct from Metacomco.

METACOMCO
26 Portland Square, Bristol BS2 8RZ.
Tel: Bristol (0272) 428781

*Existing registered users can obtain an upgrade. Contact Metacomco for details.
QL & QDOS are the trade names of Sinclair Research Ltd.

NAME ____________
ADDRESS ____________
POSTCODE ____________
TEL. NO. ____________
SIGNATURE ____________

Phone today, or post this coupon to: Metacomco, 26 Portland Square, Bristol BS2 8RZ.
Please send me:
The QL Assembler Development Kit at £39.95 ____
The QL BCPL Development Kit at £59.95 ____
THE QL LISP Development Kit at £59.95 ____
I enclose a cheque for £ ____ or debit my ACCESS/VISA Account No.
☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
Card expiry date: ____________

Price includes VAT, postage and packing UK mainland only. Delivery allow up to 28 days. YC1

DO MORE WITH YOUR COMMODORE

MAKE THE MOST OF YOUR COMMODORE COMPUTER WITH THESE BOOKS AND SOFTWARE – THERE'S SOMETHING HERE FOR EVERYONE.

COMMODORE 16

Gateway to Computing with the Commodore 16 Books 1 and 2

'Enter the gateway' and discover a new fun approach to computing and the 16 when you encounter a cast of colourful characters, problems, puzzles and projects. Start from scratch with Book 1 then develop your programming and other skills with Book 2. Ideal for the young – and young at heart!

£4.95 each/ Shiva Books/ Ian Stewart & Robin Jones

(Book 1: ISBN 1 85014 009X; Book 2: ISBN 1 85014 010 3)

Easy Programming: Commodore 16

Ideal for newcomers to computing, this book is a thorough and entertaining introduction to programming on the new C 16.

£5.95 Shiva Book/ Ian Stewart & Robin Jones *(ISBN 1 85014 008 1)*

Commodore 16 Machine Code

Covers every aspect of machine code programming on the C 16, from screen control and graphics to assembly language and debugging techniques.

£6.95 Shiva Book/ Ian Stewart & Robin Jones *(ISBN 1 85014 012 X)*

COMMODORE PLUS/4

Commodore Plus/4 Machine Code

Everything you need to know about machine code programming for the new Commodore Plus/4 – screen and keyboard control, moving graphics and colour – plus descriptions of all the facilities of TEDMON, the C Plus/4's built-in machine code monitor. Packed with simple programs and advice to help you develop your C Plus/4 machine code.

£6.95 Shiva Book/ Ian Stewart & Robin Jones *(ISBN 1 85014 014 6)*

COMMODORE 64 + VIC 20

Commodore Peripherals: A User's Guide

Want to add to your basic 64 or VIC system? Find your way through the peripherals jungle with this easy guide!

£7.95 Compute! Book/ Julie Knott & David Prochnow *(ISBN 0 942386 56 6)*

Compute!'s Commodore Collection Volume 2: Programs for the VIC and 64

£10.95 Compute! Book *(ISBN 0 942386 70 1)*

Compute!'s Third Book of Commodore 64

Outstanding games, applications, tutorials and utilities from Compute!'s magazine and Gazette – plus several never-before-published programs

£10.95 Compute! Book *(ISBN 0 942386 72 8)*

Gateway to Computing with the Commodore, Books 1 and 2

'Enter the gateway' and have fun with your C 64 while you learn the secrets of successful computing!

£4.95 each/ Shiva Books/ Ian Stewart

(Book 1: ISBN 1 85014 017 0 Book 2: ISBN 1 85014 035 9)

Commodore 64 Programmer's Notebook

First-time users and experienced programmers – cut down errors and ease frustration with this programmer's answer guide, which fills the gap left between the Owner's Manual and the Programmer's Reference Guide and shows you how to master BASIC on the 64.

£14.95 HRW Book/ Earl Savage *(ISBN 003 001294 5)*

Mind Moves: Strategic Brain Games for the Commodore 64

Tired of playing arcade games? Looking for strategy games that will challenge and entertain you and your family? Look no further! The eight intriguing games in *Mind Moves* feature strategy, words, adventure, resource management and much more.

£18.49 dilithium Press/ Book + Disk *(ISBN 0 88056 225 0)*

£18.49 dilithium Press/ Book – Cassette *(ISBN 0 88056 228 5)*

Golden Flutes and Great Escapes for the Commodore 64

Create your own games for the 64 with this straightforward guide – all you need is a small amount of BASIC programming knowledge. Four *complete* game programs are included, ready to run on disk or cassette – Golden Flutes, Great Escapes, Mars, and Treasure Hunt – with full explanations of how everything works. Check them out – then use the book to start programming your own adventure fantasies!

£18.38 dilithium Press/ Book + Disk *(ISBN 0 88056 234 8)*

£18.38 dilithium Press/ Book + Cassette *(ISBN 0 88056 207 6)*

Colour and Graphics for the Commodore 64

£13.95 HRW Book/ Andrew Veronis *(ISBN 003 000052 1)*

Compute!'s Reference Guide to CP/M on the Commodore 64 Volume 1

Everything you need to get the most out of Commodore's CP/M package and customise it to suit your own needs.

£11.95 Compute! Book/ James Doody *(ISBN 0 942386 05 5)*

Available from large branches of Boots, Menzies, W. H. Smith and bookshops, computer shops and department stores: or direct from the distributor by filling in the coupon below and sending it with your payment to HOLT SAUNDERS LTD. ACCOUNTS DEPT., 1 ST ANNE'S ROAD, EASTBOURNE BN21 3UN. Please make cheques payable to **Holt Saunders Ltd** *and allow 28 days for delivery.*

Free postage & packing on all UK orders

WRITE OR PHONE FOR YOUR FREE CATALOGUE

ORDER FORM

Please send me

ISBN	TITLE	QTY	TOTAL PRICE

I enclose payment of £.................................... by cheque ☐

or debit my credit card:

Amex ☐ Diners Club ☐ Visa ☐ Access ☐ (please tick)

Credit card number ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name (please print) ____________ YC 2/85

Address ____________

Telephone ____________ Signed ____________

Telephone credit card sales welcome – just dial 100 (UK only) and ask the operator for FREEPHONE 2568

SHIVA PUBLISHING LTD · COMPUTE! · dilithium Press · Holt, Rinehart and Winston from HOLT SAUNDERS

(listing continued from page 118)

```
0016'  7602            52             moveq #2,d3          excl device
001E'  41FA 0116       53             lea scr_name,a0      point to screen
                       54             QDOS io_open
001C'  7001            54+            moveq #io_open&$FF,d0
001E'  4E42            54+            trap #io_open/$100
0020'  4A80            54+            tst.l d0
0022'  6600 00F6       55             bne err_exit
                       56
                       57 *and save scr_ channel id in a5
                       58
0026'  2A48            59             movea.l a0,a5
                       60
                       61 *now get cartridge name and empty/good sectors
                       62
0028'  363C FFFF       63             move.w #inf,d3       timeout
002C'  204C            64             movea.l a4,a0        get dir id
002E'  43FA 0186       65             lea buffer,a1
                       66             QDOS fs_mdinf
0032'  7045            66+            moveq #fs_mdinf&$FF,d0
0034'  4E43            66+            trap #fs_mdinf/$100
0036'  4A80            66+            tst.l d0
0038'  6600 00E0       67             bne err_exit
003C'  2801            68             move.l d1,d4         save empty/good sectrs
                       69
                       70 *print cartridge name
                       71
003E'  343C 000A       72             move.w #10,d2        10 bytes in name
0042'  204D            73             movea.l a5,a0        screen chan id
0044'  43FA 00F0       74             lea buffer,a1
                       75             QDOS io_sstrg
0048'  7007            75+            moveq #io_sstrg&$FF,d0
004A'  4E43            75+            trap #io_sstrg/$100
004C'  4A80            75+            tst.l d0
004E'  6600 00CA       76             bne err_exit
                       77
                       78 *print empty sector count
                       79
0052'  2204            80             move.l d4,d1
0054'  4841            81             swap d1
                       82             VECTOR ut_mint,a2
0056'  3478 00CE       82+            move.w ut_mint,a2
005A'  4E92            82+            jsr (a2)
005C'  4A80            82+            tst.l d0
005E'  6600 00BA       83             bne err_exit
                       84
                       85 *print '/'
                       86
0062'  123C 002F       87             move.b #'/',d1
0066'  363C FFFF       88             move.w #inf,d3
                       89             QDOS io_sbyte
006A'  7005            89+            moveq #io_sbyte&$FF,d0
006C'  4E43            89+            trap #io_sbyte/$100
006E'  4A80            89+            tst.l d0
0070'  6600 00AA       90             bne err_exit
                       91
                       92 *print good sector count
                       93
0074'  3204            94             move.w d4,d1
                       95             VECTOR ut_mint,a2
0076'  3478 00CE       95+            move.w ut_mint,a2
007A'  4E92            95+            jsr (a2)
007C'  4A80            95+            tst.l d0
007E'  6600 009A       96             bne err_exit
                       97
                       98 *print line feed
                       99
0082'  123C 000A      100             move.b #lf,d1
0086'  363C FFFF      101             move.w #inf,d3
                      102             QDOS io_sbyte
008A'  7005           102+            moveq #io_sbyte&$FF,d0
008C'  4E43           102+            trap #io_sbyte/$100
008E'  4A80           102+            tst.l d0
0090'  6600 0088      103             bne err_exit
                      104
                      105 *start of loop
                      106
0094'  204C           107 loop        movea.l a4,a0        get mdv_ chan id
                      108
                      109 *test for end of file
                      110
                      111             QDOS io_pend
0096'  7000           111+            moveq #io_pend&$FF,d0
0098'  4E43           111+            trap #io_pend/$100
009A'  4A80           111+            tst.l d0
009C'  667A           112             bne.s loop_exit      exit if eof
                      113
                      114 *else fetch next dir record
                      115
009E'  7440           116             moveq #$40,d2        buffer length
00A0'  43FA 0094      117             lea buffer,a1        addr of buffer
                      118             QDOS io_fstrg
00A4'  7003           118+            moveq #io_fstrg&$FF,d0
00A6'  4E43           118+            trap #io_fstrg/$100
00A8'  4A80           118+            tst.l d0
00AA'  6600 006E      119             bne err_exit
                      120
                      121 *test file and name length for 0
                      122
00AE'  43FA 0086      123             lea.l buffer,a1      base of buffer
00B2'  4A91           124             tst.l (a1)
                      125
                      126 *branch if file length 0
                      127
00B4'  67DE           128             beq.s loop
00B6'  4A69 000E      129             tst.w $0E(a1)
                      130
                      131 *branch if name length 0
00BA'  67D8           132             beq.s loop
                      133
                      134 *calculate sector count of file
                      135
00BC'  204D           136             movea.l a5,a0        scr_ chan id in a0
00BE'  2211           137             move.l (a1),d1       get length of file
00C0'  82FC 0200      138             divu #512,d1         calc no of sectors
00C4'  4841           139             swap d1              remainder in least sig word
00C6'  4A41           140             tst.w d1             zero flg set if no remainder
00C8'  6706           141             beq.s dir_1          branch if remainder=0
00CA'  0280 0001 0000 142             add.l #$10000,d1     else incr sector count
00D0'  4841           143 dir_1       swap d1              sector count in d1.w
                      144
                      145 *print sector count
                      146
                      147             VECTOR ut_mint,a2    write sector count out
00D2'  3478 00CE      147+            move.w ut_mint,a2
00D6'  4E92           147+            jsr (a2)
00D8'  4A80           147+            tst.l d0
00DA'  6600 003E      148             bne err_exit
                      149
                      150 *tab to col 4
00DE'  123C 0004      151             move.w #4,d1
00E2'  363C FFFF      152             move.w #inf,d3       timeout
                      153             QDOS sd_tab
00E6'  7011           153+            moveq #sd_tab&$FF,d0
00E8'  4E43           153+            trap #sd_tab/$100
00EA'  4A80           153+            tst.l d0
00EC'  6600 002C      154             bne err_exit
                      155
                      156 *print file name
00F0'  43FA 0044      157             lea buffer,a1        base of buffer back in a1
00F4'  3429 000E      158             move.w $0E(a1),d2    no of bytes in name
00F8'  D2FC 0010      159             adda #$10,a1         point to start of name
                      160             QDOS io_sstrg
00FC'  7007           160+            moveq #io_sstrg&$FF,d0
00FE'  4E43           160+            trap #io_sstrg/$100
0100'  4A80           160+            tst.l d0
0102'  6600 0016      161             bne err_exit
                      162
                      163 *print line feed
                      164
0106'  123C 000A      165             move.b #lf,d1
                      166             QDOS io_sbyte
010A'  7005           166+            moveq #io_sbyte&$FF,d0
010C'  4E43           166+            trap #io_sbyte/$100
010E'  4A80           166+            tst.l d0
0110'  6600 0008      167             bne err_exit
                      168
                      169 *end loop
                      170
0114'  6000 FF7E      171             bra loop
                      172
                      173 *routine exit
                      174
0118'  4280           175 loop_exit clr.l d0                 no errors
                      176
                      177 *error exit
                      178
011A'  2600           179 err_exit  move.l d0,d3             err code
011C'  72FF           180             moveq #this_job,d1
                      181             QDOS mt_frjob        remove job
011E'  7005           181+            moveq #mt_frjob&$FF,d0
0120'  4E41           181+            trap #mt_frjob/$100
0122'  4A80           181+            tst.l d0
0124'  7000           182             moveq #0,d0
0126'  4E75           183             rts                  and ret
                      184
                      185
0128'  0005           186 dir_name  dc.w 5
012A'  4D44 5631 5F   187             dc.b 'MDV1_'
0130'                 188             cnop 0,2
0130'  0004           189 scr_name  dc.w 4
0132'  5343 525F      190             dc.b 'SCR_'
0136'                 191             cnop 0,2
0136'  =0040          192 buffer    ds.b $40
0176'                 193 buf_end
       =0040          194 buf_len   equ   buf_end-buffer
                      195
0176'  =0006          196 ri_stk    ds.b $6
017C'                 197 ri_end
                      198
017C'  =0010          199 ri_buf    ds.b $10
                      200
                      201             end
```

First World War Aerial Combat...
Fantastic 'Point of View' Arcade Action...
FLIGHTS OF FANTASY
Exciting 3-D action makes SENTINEL the most realistic point-of-view game you've ever played. You're on a starship command deck with the latest in ultra-sophisticated computerised instrumentation. Use it to navigate through deadly asteroid belts, destroy enemy ships and track their battlestars through intergalactic minefields. Along the way you'll dock and refuel. It's tough duty but you've earned the command. Now can you prevent enemy forces from capturing your home planet? It's all in your hands.
Commodore 64.
BLUE MAX
ATARI
64
SENTINEL
SELECTED TITLES AVAILABLE SOON FOR SPECTRUM
You're at the controls for this World War I dogfight game. Shoot down enemy planes, bomb targets, strafe tanks and gun emplacements – there's constant action on the incredible 3-D diagonally scrolling screen. At the same time, you have to keep track of altitude, speed, fuel and damage. Medals don't come easy. You must master a series of flying skills and perform them with pinpoint accuracy. One slip and you've lost it all – even your life. Happy landings, ace!
Commodore 64 and Atari.
ALL GAMES
CASSETTE £9.95
DISK £14.95
U.S. Gold Ltd., Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Tel: 021-359 3020.
U.S. GOLD
All American Software
synsoft
DREBS
ZAXXON
A lively, imaginative alternative to rockets and bombs. Your Dreib builds squares, his enemies knock them down. Quick reflexes, intelligence and strategy are a must.
Commodore 64 & Atari.
One of the most challenging arcade games available! Incredible 3-D graphics, diagonally scrolling screen, super sound – all in great detail.
Commodore 64.
A multi-level extravaganza! Fire on hazards; negotiate deadly caves; rescue friends! Features superb graphics, unnerving sounds and a constantly scrolling screen.
Commodore 64 & Atari.

RESPONSE FRAME

Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

SECURITY SYSTEM

I own a Vic-20 and have just finished a program which returns information to the user when a password is entered. For security, I have included a line zero in the program, to disenable the Run Stop/Restore functions. This is intended to stop a user from breaking into the program while it is running. However, when someone loads the program, Run must be typed in before the program will work. This, of course, gives the "pirate" time to list the program, and discover the password. I have heard of an automatic run sequence, such as the one on Anirog's version of *Krazy Kong*, but I cannot list the program to discover the basic idea. Please can you assist?

Timothy Carson,
Rochdale,
Lancashire.

THERE IS NO simple Poke or whatever which will give you autorun on the Vic-20, Timothy. A machine routine to do it would be some 90 to 100 bytes long. One simple thing you could do would be to 'hide' the password within the program, so it would take a lot of diligent searching to work it out. This could be done by as follows.

Don't just have a If A$ = "Password" Then line in the program. Rather, hold the password as a series of character numbers, which the computer checks element by element, comparing the numbers with the ASCII codes of the entered string.

These need not be held in the same order as the password, and need not even be in a single place within the program. Every, say, third value could be a dummy, which the computer could ignore, and so on. If you make it difficult to work out the password, from an examination of the program, you increase its security to a certain extent.

MC GRAPHICS

I have a 48K Spectrum and have been learning machine-code. Most areas of machine code are well explained in books, but I have found very little on moving graphics and sprites. Could you tell me if there are any books specifically dealing with graphics?

Mark Goodacre,
Parklands,
Northampton.

ALTHOUGH, MARK, I do not know of any books specifically dealing with the subject, I suggest the two which are most likely to be of value to you are *Supercharge Your Spectrum* by David Webb (Melbourne House, £5.95) and *Mastering Machine Code on your Spectrum* by Tony Baker (Interface Publications, £9.95). I'd be interested to hear from any publishers who have produced works dealing specifically with this area.

QL PRINTER

At present I have a ZX Spectrum, but I will be buying a QL shortly. To accompany the QL, I also intend to buy a printer. The main purpose for this is to produce a quality printout, suitable for format reports at University. However, I would also like it to be able to produce graphics. Obviously, I would need a dot matrix printer, and I gather printers such as the Brother EP44 and the Silver Reed EXD15 can produce a quality print very close to daisy-wheel quality. However, I am not sure how versatile they are with regard to graphics. Could user-define graphics be printed, for instance? If not, what kind of graphics can they print. Also, could they cope with subjects such as graphs? I intend to spend between £200 and £400.

C J Flint,
Welwyn Garden City.

I HAVE USED an Epson FX80 extensively with my QL and have had no problem reproducing anything which can be held within a program line. Note that on the QL graphics do not have the same importance as on the Spectrum. There is no built-in Basic routine for defining your own graphics, for instance. A machine-code routine is needed for this. There is also no built-in facility, like Copy, to dump the screen to the printer, although there are routines which will do this.

I often find it is better to put something like Print CHR$ (144) within a listing, rather than just a pair of quote marks with an obscure, hard-to-decipher graphic within it. To get text output to the printer from the QL, you need to open the channel to the printer — I generally use #3 — then preface the material you want with this channel number, as in Print #3, "Hello"

If program listings and straight text output form the bulk of the work you'll be doing, almost any printer will do. You can buy a very good daisy-wheel printer within your price range. Note that some printers do *not* allow you to control the *width* of the output when listing a program, which can be a major disadvantage when including listings within other material. If this is important to you, you should check this out before you decide on a particular machine.

TOO COMPLEX?

I have a program on my Commodore 64 from one of your issues which includes several machine-code routines. I am sure it is typed in correctly. When it comes to a specific line — the same line each time I try to run it — which includes SYS 38609, the program goes wrong, and the message "Formula too complex" appears on the screen. The keyboard also locks up. What is wrong?

Bjorn Sundset,
Jakobsli,
Norway.

THE SYS CALL triggers the machine-code routine starting at address 38600. As you get an error message each time from this line, it appears that there is an error in the machine-code. The error message "Formula too complex" is not significant, as machine-code errors often trigger unrelated Basic error messages.

However, the fact that you've got a Basic error message suggests the error in your machine-code program modifies something used by the Basic program. It may, for example, take something off the stack without replacing it, so the Basic program finds the wrong values when carrying out something elsewhere in the program.

AID ON AID

I own a Vic-20 and an IOIO expansion board, with a Plus 80 16K Ram, a Commodore 8K Ram, a Programmer's Aid, and a Super Expander. When I do a SYS 28681 to enable the Programmer's Aid, nothing happens. It works with the 16K Ram on its own, but when I add the other cartridges and try again, I get nothing. I would like to know if it is possible to get it to work with all the cartridges in it.

S Moore,
Hull.

THE 8K CARTRIDGE and the Programmer's Aid use memory which overlaps, so you cannot run them both at once. You should have no problems with using all the others at the same time, but the PA and the 8K cannot be used at once because of the memory overlap.

SINCLAIR LATE!

Does any reader know how to get Microdrive orders executed. I placed my order eight weeks ago, and so far have received nothing. Sinclair has not even replied to my query. I am trying to contact the Office of Fair Trading to see if they can help. Has there been any action from this body over Sinclair?

Dr A G Smith,
Belfast.

SINCLAIR RESEARCH has been the target of several approaches from the Advertising Standards Authority, mostly due to its infamous 28 days delivery promise on QL's. A spokesman for Sinclair told me that, as far as he knew, no situation had arisen which meant the Office of Fair Trading had been brought into the question.

According to the records, your order was despatched seven weeks from the date of your order. If you have not received the product by the time the letter is published, let us know, and we'll send the boys over to sort it out.

CORRUPTION

I typed in a program from an earlier issue of your magazine for the Commodore 64. I had some difficulty keying it in, due I think to there being over 80 characters in some of the lines. Eventually, I managed it, and for some time after that I played the game quite often. Then, one day, at the end of Load, "Load Error" flashed up on the screen. On listing, the program looked complete. However, the game would not run, because after typing Run, parts of some lines — and all of some other lines — were deleted, or an error message was displayed, or the machine locked up. I cannot delete nor edit the offending lines because when I press Return the listing disappears, or simply returns as it was, or the machine locks up. I have tried the tape on another Commodore 64, using another recorder, and the same result occurs. How do I play the game, without retyping the whole program.

Fred Starr,
Cheadle Hulme,
Cheshire.

UNFORTUNATELY, IT sounds as if you have corrupted your tape, either by rerecording over part of it, destroying some of the information magnetically, or by stretching, or otherwise deforming the tape physically. Short of using the "load fix" options available in some extended Basics for the CBM-64, there is nothing you can do other than type in the program again.

I suggest that, this time, you make one or more security copies of the program, which are kept on a tape which you do not generally use, so if your working copy is corrupted, you'll have another copy of the program to fall back on.

By the way, you may have noticed on the Commodore 64 that programs which include sprites, such as the one you are talking about, tend to cause more problems when loading them in than non-sprite programs. This is because the machine slows down slightly to handle the extra interrupt routines demanded by the sprites and this appears to affect the quality of the save.

SOFTWARE FILE

Software File gives you the opportunity to have your programs, ideas and discoveries published. We will accept contributions for any home computer provided they are submitted to *Your Computer* exclusively. Please double-check your programs and specify the memory they require before sending them, preferably on cassette. We pay between £6 and £36 for contributions published.

```
9950 REM   D.D.McGARR 1984
9951 INK 0: PAPER 7: BORDER 7: CLS
9952 REM LIST/LLIST START-END
9953 INPUT "FIRST LINE TO LIST ?";START
9954 INPUT "LAST LINE TO LIST ? ";END
9955 IF START = END THEN  PRINT "START AND END LINES MUST BE     DIFFERENT": CLS
 : GO TO 9952
9956 LET PROG=23635: LET VARS=23627
9957 DEF FN A(X)=256*PEEK (X+1)+PEEK X
9958 DEF FN B(X)=PEEK (X+1)+256*PEEK X
9959 LET PROG=FN A(PROG)
9960 CLS : PRINT AT 10,10;"PLEASE WAIT"
9961 LET VARS=FN A(VARS)
9962 REM FIND ADDRESS OF START               LINE
9963 LET LINEADD=PROG
9964 IF LINEADD=VARS THEN  CLS : PRINT "LINE ";START;" DOES NOT EXIST": STOP
9965 LET LINENO=FN B(LINEADD)
9966 LET LINELEN=FN A(LINEADD+2)
9967 IF  LINENO=START THEN  LET STLIN=LINENO: LET STLINEADD=LINEADD: LET STLINLE
N=LINELEN: GO TO 9971
9968 LET LINEADD=LINEADD+4+LINELEN
9969 GO TO 9964
9970 REM FIND ADDRESS OF FINISH              LINE
9971 LET LINEADD=LINEADD+4+LINELEN
9972 IF LINEADD=VARS THEN  CLS : PRINT "LINE ";END;" DOES NOT EXIST": STOP
9973 LET LINENO=FN B(LINEADD)
9974 LET LINELEN=FN A(LINEADD+2)
9975 IF  LINENO=END THEN  LET ENDLIN=LINENO: LET ENDLINEADD=LINEADD: LET ENDLINL
EN=LINELEN: GO TO 9980
9976 LET LINEADD=LINEADD+4+LINELEN
9977 GO TO 9972
9978 PRINT
9979 REM NOW PRINT LINES
9980 INPUT "LIST TO SCREEN OR PRINTER (S/P)?    ";O$
9981 CLS
9982 LET DEV=2: IF O$="P" OR O$="p" THEN  LET DEV=3
9983 REM NOW DEAL WITH PRINTING CHARACTERS , JUMPING OVER NUMBER TOKENS & UNPRIN
TABLE CHARACTERS
9984 INPUT "LINE SPACING ?                    (1=SINGLE,2=DOUBLE ETC.)    ";SP
9985 PRINT #DEV; INK 2;FN B(STLINEADD); TAB 5;
9986 FOR N=STLINEADD+4 TO ENDLINEADD+2+ENDLINLEN
9987 PRINT #DEV; INK 1;CHR$ PEEK N AND (PEEK N=13 OR PEEK N>31);
9988 IF PEEK N=14 THEN  LET N=N+5
9989 IF PEEK N=13 THEN  FOR Z=2 TO SP: PRINT #DEV: NEXT Z: PRINT #DEV; INK 2;FN
B(N+1);TAB 5;: LET N=N+4
9990 NEXT N
9991 PRINT #DEV
9992 STOP
9999 SAVE "LLIST" LINE 9950
```

List enhance

C D McGarr, Harborne, Birmingham.

SPECTRUM

THIS PROGRAM allows you to print a selected range of Basic lines to either screen or printer. It simulates the facility List/LList — line number to line number — available on other computers.

The program will run on 16K and 48K Spectrums and is Microdrive compatible. To use it, type:

RUN 9950

The program should be Merged with an existing program, or loaded before a session. Both start and end lines should exist; a message will be printed if either is absent. A message will also be printed if the start and end lines are not different.

To alter the colour of the listed line number alter line 9985, which is red at present. To change the colour of the Basic within the line alter line 9987 — blue at present.

Qwakers

Christopher Roche, Sutton Coldfield, West Midlands.

CBM-64

QWAKERS is a fairground shooting game. You must shoot all the targets with a limited number of shots within the time limit. There are four levels of difficulty and four different screens.

Controls are: Z — left; X — right; space bar — fire.

To load Qwakers, type in listing 1 and, without running it, save it to tape. Then key in listing 2 — again without running it — and save it. Now rewind the tape and load as if it were a single program.

Qwakers. Listing 1.

```
10 PRINT"■          READING MACHINE CODE"
20 FORT=0TO11:CH=0:FORS=0TO15:READM:CH=CH+M:POKE49152+T*16+S,M:NEXT:READCH
30 IFM<>(CHAND255)THENPRINT"■TYPING ERROR IN LINE"PEEK(63)+256*PEEK(64):END
40 SU=SU+CH:NEXT:IFSU<>24741THENPRINT"TYPING ERROR IN LINES 1000-1110":END
50 REM THE FOLLOWING TWO LINES WILL NEW AND LOAD THE NEXT PROGRAM ON TAPE
60 POKE631,78:POKE632,69:POKE633,87:POKE634,13:POKE635,76:POKE636,111:POKE637,13
70 POKE638,82:POKE639,117:POKE640,13:POKE198,10
80 :
90 REM******** MACHINE CODE DATA*******
100 :
110 :
120 DATA120,159,192,141,21,3,169,13,141,20,3,88,96,155,254,208,11
130 DATA4,198,2,240,3,76,49,234,173,255,3,133,2,32,35,192,95
140 DATA75,49,234,162,0,138,74,168,189,188,2,41,127,240,110,189,195
150 DATA130,2,40,51,133,252,254,0,208,208,9,173,16,208,25,164,147
160 DATA132,141,16,208,109,0,208,221,228,2,144,23,138,74,174,0,173
170 DATA173,16,208,57,164,192,240,8,189,188,2,9,128,157,188,2,129
180 DATA198,252,208,210,76,157,192,41,127,133,252,222,0,208,189,0,161
190 DATA238,201,255,208,11,173,16,208,57,172,192,141,16,208,169,255,186
200 DATA221,208,2,176,20,138,74,176,3,173,16,208,57,164,192,208,249
210 DATA46,189,188,2,41,127,157,188,2,198,252,208,206,232,224,15,190
220 DATA208,131,56,254,1,2,4,8,16,32,64,128,254,253,251,247,137
230 DATA239,223,191,127,13,13,251,255,0,3,255,255,0,0,255,255,20
```

Qwakers. Listing 2.

```
10 FORN=54272TO54296:POKEN,0:NEXT
20 POKE54296,15:LE=4000
30 POKE53269,0:RESTORE
40 POKE650,128:PRINTCHR$(8):POKE254,1
50 GOSUB770:REM TITLE PAGE
60 GOSUB1310:REM MUSIC  FOR TITLE PAGE
70 GOTO940:REM PICK SKILL LEVEL
80 GOSUB520:REM DRAW BOX FOR DUCKS
90 V=53248:OC=1
100 POKE2040,192:POKE2041,193:POKE2042,194:POKE2043,195:POKE2044,196:POKE2045,19
7
110 POKE2046,198:POKE2046,198:POKE2047,199
120 POKEV+39,2:POKEV+39,2:POKEV+40,5:POKEV+41,8:POKEV+42,6:POKEV+43,9:POKEV+44,3
130 POKEV+46,1:POKEV+45,4
140 FORN=0TO62:READQ:POKE12288+N,Q:NEXT
150 FORN=0TO62:READQ:POKE12352+N,Q:NEXT
160 FORN=0TO62:READQ:POKE12416+N,Q:NEXT
170 FORN=0TO62:READQ:POKE12480+N,Q:NEXT
180 FORN=0TO62:READQ:POKE12544+N,Q:NEXT
190 FORN=0TO62:READQ:POKE12608+N,Q:NEXT
200 FORN=0TO62:READQ:POKE12672+N,Q:NEXT
210 FORN=0TO62:READQ:POKE12736+N,Q:NEXT
220 POKEV+1,:16
230 POKEV+3,:16
240 POKEV+5,:16
250 POKEV+7,:16
260 POKEV+9,:16
270 POKEV+13,116
280 POKEV+11,210
290 SYS49152
300 POKE254,1
310 POKE1023,2:POKE2,2
320 POKE700,2:POKE701,0:POKE702,2:POKE703,0:POKE704,2:POKE705,0:POKE706,2
330 POKE707,0:POKE708,2:POKE709,0
340 POKE713,0:POKE712,2
350 FORA=720TO729:B=0
360 POKEA,B:NEXT
370 FORA=740TO749:B=0
380 POKEA,B:NEXT:TI$="000000"
390 POKEV,21:POKEV+2,65:POKEV+4,105:POKEV+6,145:POKEV+8,185:POKEV+12,222
400 REM*********************************
410 REM*          MAIN LOOP            *
420 REM*********************************
430 POKEV+21,255:POKE254,0:SH=10
440 PRINT"■■■■■■PLEASE WAIT FOR DUCKS"
450 PRINT"■■■■■■■ MOVE INTO POSITION ":FORSD=1TO3000:NEXT
460 PRINT"■■■■■■■                   "
470 PRINT"■■■■■■                     "
480 REM MOVE GUN
490 GETA$:XX=0
500 IFA$="Z"THENXX=-5
510 IFA$="X"THENXX=+5
520 IFA$=" "THENGOTO1530
530 C=C+XX:IFC>240THENC=240
540 IFC<35THENC=35
550 POKEV+10,C
560 PRINT"■":PRINTSPC(33)"■■■■■■     ■■■■TIME ■■■■■■■";TI$
570 PRINT"■■■■■■■■■■■SHOTS■■■■■■■■";SH;"■ "
580 GOTO490
590 REM*********************************
600 REM*          DRAW BOX             *
610 REM*********************************
620 POKE 53280,0:POKE53281,0:PRINTCHR$(147)
630 PRINTTAB(33)"■■■________"
640 FORA=1TO7:PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■       ":NEXT
650 PRINTTAB(33)"________"
660 PRINT"■■■■■■ ■                                     ■■"
670 PRINT"■■■                                        ■■"
680 PRINT"■■
690 PRINT"■■ ::  ■                                 ::  ■■ "
700 PRINT"■■ ::  ■          QWAKERS                ::  ■■ "
710 PRINT"■■ ::  ■                                 ::  ■■ "
720 PRINT"■■ :: ■■______________________________■■ ■■ "
730 PRINT"■■ ■■■^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^■■■ "
740 PRINT"■■
750 RETURN
760 REM*********************************
770 REM*          TITLE SCREEN         *
780 REM*********************************
790 POKE53280,7:POKE53281,3:PRINTCHR$(147)
800 PRINT
```


(continued on next page)

(continued from previous page)

```
810 PRINT"
820 PRINT"
830 PRINT"
840 PRINT"
850 PRINT"
860 PRINT"
870 PRINT"
880 PRINT"
890 PRINT:PRINTSPC(13)"BY CHRIS ROCHE"
900 RETURN
910 REM**********************************
920 REM*        PICK SKILL LEVEL        *
930 REM**********************************
940 POKE53280,0:PRINT"
950 PRINT"":PRINT
960 PRINTTAB(10)"
970 PRINTTAB(10)"
980 PRINT" INNOCENT
990 PRINTTAB(10)"
1000 PRINTTAB(10)"
1010 PRINTTAB(10)"
1020 PRINTTAB(10)"
1030 PRINT" ROOFER
1040 PRINTTAB(10)"       PLEASE ENTER YOUR"
1050 PRINTTAB(10)"
1060 PRINTTAB(10)"       LEVEL OF SKILL"
1070 PRINTTAB(10)"
1080 PRINT" DAREDEVIL
1090 PRINTTAB(10)"
1100 PRINTTAB(10)"
1110 PRINTTAB(10)"
1120 PRINTTAB(10)"
1130 PRINT" CRAZY
1140 PRINTTAB(10)"
1150 PRINTTAB(10)"
1160 GOTO1220
1170 Z=2:GOTO80
1180 Z=3:GOTO80
1190 Z=4:GOTO80
1200 Z=5:GOTO80
1210 N=PEEK(197)
1220 IFN<>0ANDN<>THEN12.0
1230 IFN=4THENN=1:GOTO1280
1240 IFN=THENN=2:GOTO1280
1250 IFN=THENN=3:GOTO1280
1260 IFN=THENN=4
1270 PRINT""
1280 ONNGOTO1170,1180,1190,1200
1290 REM**********************************
1300 REM*    MUSIC FOR TITLE PAGE       *
1310 REM**********************************
1320 S=54272
1330 FORL=0TO24:POKES+L,0:NEXT
1340 POKES+3,8
1350 POKES+5,41:POKES+6,89
1360 POKES+14,177
1370 POKES+18,16
1380 POKES+24,143
1390 READFR,DR
1400 IFFR=0THENGOTO940
1410 POKES+4,65
1420 FORT=1TODR*2
1430 FQ=FR+PEEK(S+27)/2
1440 HF=INT(FQ/256):LF=FQAND255
1450 POKES+0,LF:POKES+1,HF
1460 NEXT
1470 POKES+4,64
1480 GOTO1390
1490 RETURN
1500 REM**********************************
1510 REM* FIRE BULLET AND MAKE SOUND    *
1520 REM**********************************
1530 POKE54277,25
1540 POKE54278,199
1550 POKE54272,23
1560 POKE54276,133
1570 FORN=1TO21STEP2
1580 POKE54273,N:NEXT
1590 POKE54276,128
1600 POKEV+46,1:POKEV+14,C:FORA=200TO124STEP-1.2:POKEV+15,A:NEXT
1610 POKEV+30,1:POKEV+21,128+PEEK(V+21)AND(127-PEEK(V+30)+128)
1620 POKEV+30,1:POKEV+21,PEEK(V+21)AND(127-PEEK(V+30))+128
1630 POKEV+21,128+PEEK(V+21)AND(127-PEEK(V+30)+128):POKEV+46,0
1640 IFPEEK(53269)=160THENOC=OC+1:GOTO1675
1650 SH=SH+1:IFSH=0THENGOTO2210
1660 POKE198,0:GOTO530
1670 IFOC=2THEN1730
1680 IFOC=3THEN1850
1690 IFOC=4THEN2060
1700 IFOC=5THENZ=Z+2:GOTO1730
1710 IFOC=6THEN1850
1720 IFOC=7THEN2060
1730 REM**********************************
1740 REM*        LEVEL TWO               *
1750 REM**********************************
1760 PRINT"BONUS OF 3 SHOTS"
1770 FORI=0TO62:READQ:POKE12288+I,Q:NEXT
1780 FORI=0TO62:READQ:POKE12352+I,Q:NEXT
1790 POKEV+21,163
1800 SH=SH+3
1810 POKE720,30:POKE721,95:POKE740,0:POKE741,120:POKE701,Z:REM SPRITE ONE
1820 POKE722,30:POKE723,95:POKE742,0:POKE743,120:POKE703,Z+2:REM SPRITE TWO
1830 PRINT"
1840 GOTO530
1850 REM**********************************
1860 REM*        LEVEL THREE             *
1870 REM**********************************
1880 PRINT"BONUS OF 3 SHOTS"
1890 FORI=0TO62:READQ:POKE12288+I,Q:NEXT
1900 FORI=0TO62:READQ:POKE12352+I,Q:NEXT
1910 FORI=0TO62:READQ:POKE12416+I,Q:NEXT
1920 FORI=0TO62:READQ:POKE12480+I,Q:NEXT
1930 FORI=0TO62:READQ:POKE12544+I,Q:NEXT
1940 FORI=0TO62:READQ:POKE12672+I,Q:NEXT
1950 POKEV+21,175
1960 SH=SH+5
1970 PRINT"
1980 POKE720,0:POKE721,95:POKE740,0:POKE741,120:POKE701,Z+2:POKE700,0
1990 POKE722,0:POKE723,95:POKE742,0:POKE743,120:POKE703,Z:POKE702,0
2000 POKE724,0:POKE725,95:POKE744,0:POKE745,120:POKE705,Z-1:POKE704,0
2010 POKE726,0:POKE727,95:POKE746,0:POKE747,120:POKE707,Z+3:POKE706,0
2020 POKEV+0,42:POKEV+2,110:POKEV+4,160:POKEV+6,210
2030 POKEV+39,3:POKEV+40,5:POKEV+41,7:POKEV+42,13
2040 PRINT"
2050 GOTO530
2060 REM**********************************
2070 REM*        LEVEL FOUR              *
2080 REM**********************************
2090 PRINT"BONUS OF 3 SHOTS"
2100 POKE720,0:POKE721,95:POKE740,0:POKE741,120:POKE701,Z:POKE700,Z
2110 POKE722,0:POKE723,95:POKE742,0:POKE743,120:POKE703,Z:POKE702,Z
2120 POKE724,0:POKE725,95:POKE744,0:POKE745,120:POKE705,Z:POKE704,Z
2130 POKE728,0:POKE729,95:POKE748,0:POKE749,120:POKE709,Z:POKE708,Z
2140 POKE726,0:POKE727,95:POKE746,0:POKE747,120:POKE737,Z:POKE706,Z
2150 POKE732,0:POKE733,95:POKE752,0:POKE753,120:POKE713,Z:POKE712,Z
2160 POKEV+0,30:POKEV+2,70:POKEV+4,110:POKEV+6,150:POKEV+8,190:POKEV+12,230
2170 POKEV+39,3:POKEV+40,5:POKEV+41,7:POKEV+42,13
2180 PRINT"
2190 POKEV+21,255
2200 FORC=1TO3000:NEXT:GOTO530
2210 REM**********************************
2220 REM*        GAME OVER               *
2230 REM**********************************
2240 PRINT"
2250 PRINTTAB(7)"
2260 PRINTTAB(7)"
2270 PRINTTAB(7)"
2280 A$="  GAME OVER  "
2290 POKE198,0
2300 PRINT"ANOTHER GO? (Y/N)"
2310 PRINT"
2320 FORA=1TO50:NEXT
2330 C$=RIGHT$(A$,14)+LEFT$(A$,1)
2340 A$=C$
2350 PRINTTAB(8);A$
2360 GETB$:IFB$<>"Y"ANDB$<>"N"THEN2316
2370 IFB$="Y"THENRUN
2380 SYS64738
2390 REM****DATA FOR TITLE MUSIC****
2400 DATA4817,2,5103,2,5407,2
2400 DATA8583,4,5407,2,8583,4
2410 DATA5407,4,8583,12,9634,2
2420 DATA10207,2,10814,2,8583,2
2430 DATA9634,4,10814,2,8583,2
2440 DATA9634,4,8583,12,0,0
2450 REM
2460 DATA0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,7,128,0,9,192,0,127,159,135,127,255,222
2470 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255,192,3,255,192
2480 DATA 0,0,0,0,0,0,0,0,3,0,1,0,0,0,0,0,0,0
2490 DATA0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,7,128,0,9,192,0,127,159,135,127,255,222
2500 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255,192,3,255,192
2510 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2520 REM
2530 DATA0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,7,128,0,9,192,0,127,159,135,127,255,222
2540 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255,192,3,255,192
2550 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2560 REM
2570 DATA0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,7,128,0,9,192,0,127,159,135,127,255,222
2580 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255,192,3,255,192
2590 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2600 REM
2610 DATA0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,7,128,0,9,192,0,127,159,135,127,255,222
2620 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255,192,3,255,192
2630 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2640 REM
2650 DATA0,15,192,0,30,192,0,6,,192,0,123,192,0,247,128,1,239,0,1,239,0,3,222
2660 DATA0,7,188,0,15,120,0,0,248,3,16,232,0,16,200,0,16,208,0,16,224,0,16
2670 DATA192,0,16,192,0,16,192,0,16,192,0,16,192,0,31,130,0
2680 REM
2690 DATA0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,7,120,0,9,192,0,127,159,135,127,255,222
2700 DATA 15,127,188,30,255,184,30,254,120,15,1,240,3,255,192,3,255,192
2710 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2720 REM
2730 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,128,0,1,128,0,1,128,0,0,0,0,0,0
2740 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2750 REM
2760 DATA  0,0,0,0,0,0,0,0,0,127,0,1,255,192,3,255,224,7,255,240,15,255,248
2770 DATA31,255,248,31,255,248,31,255,240,31,255,248,15,255,240,15,255
2780 DATA240,7,255,224,3,255,192,1,255,128,0,126,0,0,0,0,0,0,0,0,0,0,0
2790 REM
2800 DATA  0,0,0,0,0,0,0,0,0,127,0,1,255,192,3,255,224,7,255,240,15,255,248
2810 DATA31,255,240,31,255,248,31,255,248,31,255,248,15,255,240,15,255
2820 DATA240,7,255,224,3,255,192,1,255,128,0,126,0,0,0,0,0,0,0,0,0,0,0,0
2830 REM
2840 DATA0,3,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192,7
2850 DATA255,192,1,199,0,0,124,0,0,108,0,0,108,3,0,108,0,3,239,128,0,0,0,0,0,0
2860 DATA0,3,0,0,0,0,0,0,0,0,0,0
2870 REM
2880 DATA0,3,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192,7
2890 DATA255,192,1,199,0,0,124,0,0,108,0,0,108,3,0,108,0,3,239,128,0,0,0,0,0,0
2900 DATA0,3,0,0,0,0,0,0,0,0,0,0
2910 REM
2920 DATA0,3,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192,7
2930 DATA255,192,1,199,0,0,124,0,0,108,0,0,108,3,0,108,0,3,239,128,0,0,0,0,0,0
2940 DATA0,3,0,0,0,0,0,0,0,0,0,0
2950 REM
2960 DATA0,3,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192,7
2970 DATA255,192,1,199,0,0,124,0,0,108,0,0,108,3,0,108,0,3,239,128,0,0,0,0,0,0
2980 DATA0,3,0,0,0,0,0,0,0,0,0,0
2990 REM
3000 DATA0,3,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192,7
3010 DATA255,192,1,199,0,0,124,0,0,108,0,0,108,3,0,108,0,3,239,128,0,0,0,0,0,0
3020 DATA0,3,0,0,0,0,0,0,0,0,0,0
3030 REM
3040 DATA0,3,0,0,124,0,0,254,0,1,187,0,3,17,128,3,1,128,7,69,192,7,17,192,7
3050 DATA255,192,1,199,0,0,124,0,0,100,0,0,100,3,0,100,0,3,239,120,0,0,0,0,0,0
3060 DATA0,3,0,3,0,0,0,0,0,0,0,0
```

Submarine

S Edwardes,
London SE19.

AMSTRAD

THE PROGRAM is an adaptation of an old arcade game in which the player — in a submarine — has to sink as many ships as possible in the time allowed while avoiding the mines dropped by the ships.

The program aims to show some of the very advanced features of the Amstrad and has been documented, within the program, in order that general principles can be seen and to allow for improvements or modifications.

The program uses the very versatile interrupt commands together with the extensive sound possibilities of this machine including multi-channel tunes and special sound effects, e.g. a "whoosh" as the torpedo is fired, explosions etc., and a fairly regular sonar bleep which is also interrupt driven.

The game is written for use with a Quickshot II Joystick but could easily be adapted for keyboard control by altering lines 210-230. All rem lines — starting with either Rem or ' — may be removed but are useful for seeing how the program is built up.

Rules are not included in the program but are very straightforward. The object of the game is to sink as many ships as possible within the given time. To do this you move the cursor left or right in order to line it up with the finishing point of each torpedo. The torpedos start from the nose of the sub which remains bottom centre of screen.

When the first button is pressed a simple trig formula moves the torpedo gradually to the position of the cursor and hopefully hits a ship.

For each ship hit you score 50 points. The ships drop mines at random which home-in on the sub. These may be stopped by a direct hit from a torpedo or may very occasionally stop of their own free will in which case a torpedo fired at them will have been a waste of time. If a mine hits the sub, you lose a life.

If you lose five lives the game ends. Lastly, right at the beginning you are asked to input the level of difficulty. This figure sets the speed at which the Every command is called and so affects the speed of the ships across the screen.

Program notes and main variables.

Lines:

15-90	Set level of difficulty.
100	Sets up main variables — see below.
110	Jumps to initial screen, array for note frequency and duration, and plays tune.
130	Useful when typing in program. Defines small Enter key to list in black on white.
150	Sets up more variables.
160	Jumps to main screen, windows, volume and tone envelopes and UDG definitions.
170-180	Interrupt commands.
190-670	Main loop.
680-1010	Interrupt routine to move ship. Also random mine generation: test for mine-hit etc.
1020-1360	Main screen, windows etc.
1390-1710	Primary screen, music etc.
1750-2210	End of game routines.

Variables.

tim = amount of time allowed. Initially 100 — about 2½ mins.

Lev = speed of interrupt routine — 1 to 5.

```
10 '************ c.  S.EDWARDES 1984 *************
15 MODE 0:INK 0,1:INK 1,26
20 LOCATE 1,9
30 PRINT"PLEASE ENTER LEVEL:-                    (1=H
ARD: 5=EASY)"
40 LOCATE 1,20
50 INPUT lev
60 IF lev<1 OR lev>5 THEN GOTO 70 ELSE GOTO 100
70 CLS:LOCATE 6,12:PRINT"TRY AGAIN":CHR$(7)
80 FOR n=1 TO 1500:NEXT n
90 RUN
100 sc=0:tim=100:l=5
110 GOSUB 1420
120 MODE 1
130 KEY 139,"mode 2:border 13:ink 0,13:ink 1,0:paper 0
:pen 1:list"+CHR$(13)
150 x=1:xs=10:ox=320:oy=28:ymine=272:fired=0:mine=0
160 GOSUB 1050:          REM            ****** SET UP SCR
EEN ETC ******
170 EVERY lev+10,3 GOSUB 690
180 EVERY 75,2 GOSUB 970
190 DI:                  REM            ****** AVOIDS COR
UPTING SCREEN ******
200                      REM          ****** MOVE SIGHTS & C
HECK FOR VALID FIRE ******
210 xs=xs-(JOY(0)=8)+(JOY(0)=4)
220 IF JOY(0)>=16 AND fired=0 THEN GOSUB 1320:fired=1
230 IF JOY(0)<16 AND fired=0 THEN GOTO 610
240 oy=oy+16
250 px=295-(oy-16)*((ox-xs2)/272)
260 PLOT px,oy
270 TAG
280 PRINT" ";CHR$(231);" ";
290 TAGOFF
300 REM                        ****** MINE HIT ******
310 IF px>=xmine+8 OR px<=xmine-8 AND oy>=ymine+8 OR o
y<=ymine-8 THEN GOTO 400
320 TAG
330 MOVE px,oy
340 PRINT"    ";
350 MOVE px,oy-16
360 PRINT"    ";
370 TAGOFF
380 fired=0:oy=28
390 ymine=272
400 IF oy<255 THEN GOTO 530
410 '
420 '
430 '
440 REM                        ******* SHIP HIT ******
450 '
460 '
470 IF px>=(x-4)*16 AND px<=(x+2)*16 THEN SOUND 1,500,
165,0,2,1,15:FOR n=1 TO 50:LOCATE x,9:PRINT shiphit$:N
EXT n:LOCATE x,9:PRINT"     ":x=1:sc=sc+50:PRINT#1,"SCO
RE=";sc;
480 '
490 '
500 REM                        ****** TORPEDO OFF SCREEN ****
**
510 '
520 '
530 IF oy>=265 THEN LOCATE (INT(px/16))+2,25-(INT(oy/1
6)):PRINT"  ":LOCATE(INT(px/16))+1,26-(INT(oy/16)):PRI
NT"    ":fired=0:oy=28:LOCATE 20,25:PRINT CHR$(204);CH
R$(205);
540 px=295-(oy-16)*((ox-xs2)/272)
550 oy2=oy-16
560 MOVE px-32,oy2
570 TAG
580 PRINT"      ";
590 TAGOFF
600 LOCATE 20,25:PRINT CHR$(204);CHR$(205);
610 IF xs<1 THEN xs=1
620 IF xs>38 THEN xs=38
630 LOCATE xs,10
640 PAPER 0
650 PRINT" "; CHR$(244);" "
660 EI
670 GOTO 190
680                    REM            ****** SHIP MOVE ROUT
INE ******
690 LOCATE x,9
700 PRINT" ";CHR$(240);CHR$(241);CHR$(242);CHR$(243)
710 IF ymine=272 THEN GOSUB 1350
720 IF ymine<272 THEN GOTO 730 ELSE IF INT(RND*10)+1<>
1 THEN GOTO 940
730 ymine=ymine-6
740 xmine=300-((320-xm2)/240)*(ymine-32)
750 IF ymine>25 THEN GOTO 870
760 SOUND 1,200,100,7,0,0,10
770 FOR n=1 TO 10
780 LOCATE 19,25:PRINT sub$
790 LOCATE 20,25:PRINT sub$
800 LOCATE 21,25:PRINT sub$
810 LOCATE 20,25:PRINT sub$
820 LOCATE 19,25:PRINT sub$
830 NEXT n
840 l=l-1:PRINT#3,"LIVES";l
850 IF l=0 THEN GOTO 1790
860 ymine=272:GOTO 940
870 MOVE xmine,ymine
880 TAG
890 PRINT" * ";
900 IF ymine>=257 THEN GOTO 930
910 MOVE xmine,ymine+16
920 PRINT"   ";
930 TAGOFF
940 x=x+1
950 IF x=36 THEN LOCATE 36,9:PRINT"     ":x=1
960 RETURN
970 SOUND 1,55,75,8,3,2,0
980 tim=tim-1
990 PRINT #2,"TIME=";tim
1000 IF tim=0 THEN GOTO 2020
1010 RETURN
1020                  REM            ****** VOL. & TONE EN
VELOPES : INK COLOURS SET :
                                 SCREEN & WINDOWS DRAWN
: U.D.G'S DEFINED ******
1030 '
1040 '
1050 ENV 1,5,3,1,1,0,10,30,-1,10
1060 ENV 2,11,-1,25
1070 ENV 3,15,-1,5
1080 ENT 1,9,49,5,9,-10,15
1090 ENT 2,2,2,3,2,-2,3
1100 BORDER 0
1110 INK 0,1:INK 1,26:INK 2,11:INK 3,6
1120 FOR n=2 TO 8
1130 LOCATE 1,n
1140 PAPER 2
1150 PRINT"                                        "
1160 NEXT n
1170 WINDOW #1,1,11,1,1:PAPER #1,3
1180 WINDOW #2,15,24,1,1:PAPER #2,3
1190 WINDOW #3,31,40,1,1:PAPER #3,3
1200 PRINT#1,"SCORE=";sc:PRINT #2,"TIME=";tim:PRINT #3
,"LIVES=";l
1210 SYMBOL 240,0,0,0,31,4,255,127,63
1220 SYMBOL 241,2,2,15,63,63,255,255,255
1230 SYMBOL 242,0,0,192,255,255,255,255,255
1240 SYMBOL 243,0,0,0,240,254,252,248,240
1250 SYMBOL 245,0,0,86,170,0,0,0,0
1260 SYMBOL 246,17,59,58,30,31,15,7,3
1270 SYMBOL 247,128,65,2,4,8,16,255,255
1280 SYMBOL 248,68,76,30,60,120,240,224,192
1290 shiphit$=CHR$(246)+CHR$(247)+CHR$(248)+" "
1300 sub$=" "+CHR$(204)+CHR$(205)+" "
1310 RETURN
1320 xs2=(xs*16)
```

(continued on next page)

(continued from previous page)

```
1330 SOUND 1,200,90,15,1,0,9
1340 RETURN
1350 xm2=(x*16)
1360 RETURN
1370 '
1380 '
1390 REM                    ***** MUSIC *****
1400 '
1410 '
1420 MODE 0
1430 BORDER 11,16
1440 LOCATE 7,6:PRINT"   YOU HAVE APPROX.   "
1450 PRINT
1460 LOCATE 5,10:PRINT;(tim*1.5);"SECONDS"
1470 PRINT
1480 PRINT
1490 PRINT"     TO SINK THE     "
1500 PRINT
1510 PRINT
1520 PRINT"          CONVOY        "
1530 DIM notes1(25)
1540 DIM notes2(25)
1550 DIM dur1(25)
1560 DIM dur2(25)
1570 FOR a=1 TO 25
1580 READ notes1(a)
1590 READ dur1(a)
1600 NEXT a
1610 FOR a=1 TO 25
1620 READ notes2(a)
1630 READ dur2(a)
1640 NEXT a
1650 DATA 379,50,0,2,379,23,358,25,0,2,358,23,0,25,379
,25,358,25,379,25,426,25,478,25,506,75,426,25,319,50,3
58,50,379,12.5,478,12.5,358,12.5,426,12.5,319,25,358,2
5,379,50,426,50,478,75
1660  DATA 638,75,478,25,0,2,478,23,0,2,478,23,0,25,47
8,25,568,25,478,25,568,25,478,25,426,75,506,25,478,50,
506,50,638,12.5,758,12.5,506,12.5,638,12.5,478,25,568,
25,478,50,638,50,758,75
1670 FOR a=1 TO 25
1680 SOUND 17,notes1(a),dur1(a)
1690 SOUND 10,notes2(a),dur2(a)
1700 NEXT a
1710 RETURN
1720 '
1730 '
1740 '
1750 REM                ***** END OF GAME ROUTINES ****
*
1760 '
1770 '
1780 '
1790 FOR n=1 TO 3000:NEXT n:MODE 0
1800 LOCATE 10,26:PRINT"          BAD LUCK        "
1810 PRINT
1820 PRINT" YOU WERE DESTROYED "
1830 PRINT
1840 PRINT"          BY MINES        "
1850 PRINT
1860 PRINT"   BUT YOU SCORED   "
1870 PRINT
1880 PRINT
1890 PRINT"              ";sc
1900 PRINT
1910 PRINT
1920 PRINT"           POINTS      "
1930 PRINT
1940 PRINT
1950 PRINT"    WANT ANOTHER GO   "
1960 PRINT
1970 PRINT
1980 GOSUB 2190
1990 STOP
2000 '
2010 '
2020 DI:MODE 0
2030 LOCATE 10,5:PRINT" YOUR TIME RAN OUT "
2040 PRINT
2050 PRINT
2060 PRINT"   BUT YOU SCORED   "
2070 PRINT
2080 LOCATE 8,14:PRINT;sc
2090 PRINT
2100 PRINT
2110 PRINT"          POINTS      "
2120 PRINT
2130 PRINT
2140 PRINT"    WANT ANOTHER GO    "
2150 PRINT
2160 PRINT"          (y/n)        "
2170 GOSUB 2190
2180 STOP
2190 a$=INKEY$:IF a$="" THEN GOTO 2190
2200 IF a$="y" THEN RUN ELSE IF a$="n" THEN RETURN
2210 GOTO 2190
```

The Mine

F Clancy,
Manchester.

ZX-81

FULL INSTRUCTIONS on playing The Mine are included in the program. To save a copy of The Mine, first type in on line 1 a Rem statement containing at least 670 characters. Next type in the standard hex loader given. Then run this program and type in the hex code given in listing 2. Then delete the hex loader, leaving line 1 intact.

Finally enter the rest of the Basic program given in listing 3 and save the finished program by entering Goto 770.

Listing 1. The hex loader.

```
 99 REM HEX LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=S TO F STEP 8
150 LET T=0
160 PRINT N;" - ";
170 INPUT A$
180 PRINT A$;" - ";
190 INPUT TOT
200 PRINT TOT
210 LET Z=0
220 FOR K=1 TO LEN A$ STEP 2
230 LET C=(CODE A$(K)-28)*16+CO
DE A$(K+1)-28
240 LET T=T+C
250 POKE N+Z,C
260 LET Z=Z+1
270 NEXT K
280 IF TOT=T THEN GOTO 310
290 PRINT "ERROR - PLEASE INPUT
AGAIN"
300 GOTO 150
310 NEXT N
```

Listing 2.

```
16519 - 2A0C401188001922 - 330
16527 - FE7F115B001922CC - 752
16535 - 7F3E0032F27F32C3 - 853
16543 - 7F2A0C4011580019 - 376
16551 - 22C47F3EFA32C67F - 1044
16559 - 21000022C77F2AFE - 659
16567 - 7F3F2640FEDF2008 - 804
16575 - 3A2540FEF720012B - 736
16583 - 3A2540FEEF20173A - 765
16591 - 2640FEF720012311 - 688
16599 - 2100FEEF2003A7ED - 965
16607 - 52FEDF20011922FA - 901
16615 - 7F7EFE002819FE88 - 962
16623 - 2815FE1720080E05 - 392
16631 - 21F27F34C0ED4E10 - 954
16639 - 062AFE7F22FA7F2A - 882
16647 - FE7F36002AFA7F36 - 928
16655 - 1522FE7F3EB41121 - 728
16663 - 002AC07FA7ED52BE - 1047
16671 - 204A19E5A7ED52BE - 1036
16679 - 203A360013634A7 - 354
16687 - ED5218F0E1E53AFE - 1249
16695 - 7F5D201634FF7FBC - 958
16703 - 20101922FE7F7EFE - 888
16711 - 002805E122FE7FC9 - 886
16719 - 3615E1197EFE0028 - 748
16727 - 06FE152802180D3E - 422
16735 - 66064610FE3DFE34 - 815
16743 - 20F718873E341121 - 650
16751 - 002AFF7FF5A7ED52 - 1139
16759 - BE2004CBFE18F6E1 - 1178
16767 - 22CA7F2AFE7F1121 - 836
16775 - 00A7ED523E03BE20 - 773
16783 - 123AF27FFE05200B - 747
16791 - 19360021C67F46CD - 712
16799 - EB42C9ED5B0C402A - 948
16807 - FE7FF7ED52112100 - 917
16815 - 3EFFED5C3C30FBFE - 1249
16823 - 143828197DFE0938 - 585
16831 - 22FE10301E2AC77F - 750
16839 - 3E2EEE28163A3440 - 534
16847 - 1CFFDC241C30F5ED - 1099
16855 - 4B0C402178020919 - 343
16863 - 22077F2AC77F7EFE - 1108
16871 - 2E20171121003600 - 205
16879 - 197EFE1520033E2E - 561
16887 - 39FE0020053E2E22 - 626
16895 - C77F0121002AC07F - 733
16903 - E5ED5B0C40A7ED52 - 1119
16911 - 3EFF3CA7ED4230FA - 1145
16919 - C9452AFE7FA7ED52 - 987
16927 - 58060013FF14A7ED - 795
16935 - 4230FA0E454FE17B - 669
16943 - E8330C2E3DB63001 - 578
16951 - 237EFE0028022AFE15 - 772
16959 - 28172ACC7F798A11 - 750
16967 - 2100F5200119F138 - 649
16975 - 03A7ED52 EFE1520 - 922
16983 - 0835082ACC7F3E00 - 500
16991 - C9FE0028032ACC7F - 871
16999 - E52ACC7F3600E136 - 935
17007 - 0B22CC7F3AC37F3E - 994
17015 - 0132037FFE202047 - 732
17023 - 21C57F7E35FE00C8 - 991
17031 - D60F280430FA1837 - 652
17039 - 2A0C40115E001906 - 260
17047 - 0735162B10FB2AC4 - 631
17055 - 7F3AC67F3C361E28 - 854
17063 - 0430FA13042B22C4 - 600
17071 - 7F7EC87F28350687 - 765
17079 - A61808FE0120043E - 556
17087 - 001803060037077 2A - 357
17095 - CC7F3E300063C10FE - 857
17103 - 3DFE172002360BFE - 819
17111 - 0020F12A0C40115E - 502
17119 - 0019060736002B10 - 151
17127 - FBC3B5403E260E21 - 838
17135 - 21864034BE200736 - 566
17143 - 1C280CB920F510EE - 799
17151 - ED5B0C40211A0019 - 488
17159 - 118240EB010500ED - 689
17167 - B0C97E0005A000E1 - 738
17175 - C9 - 201
```

Listing 3.

```
 10 LET A=0
 20 FOR H=16514 TO 16518
 30 POKE H,28
 40 NEXT H
 50 POKE 17100,140
 60 LET D=0
 70 PRINT AT 0,1;"HIGH 000000
    SCORE 000000"
 80 PRINT AT 0,11-LEN STR$ A;A
 90 FOR F=1 TO 3
100 PRINT AT 1,14;"▀▀▀▀";TAB
13;"▀▀▀▀▀▀       ▀"
```

```
110 PRINT "
120 PRINT "        0          0
130 PRINT "        0   0
140 PRINT "               0    0
150 PRINT "                    0
160 PRINT "      0        0
170 PRINT "
180 PRINT "              READY
190 PRINT "
200 PRINT "        0
210 PRINT "   0 0       0
220 PRINT "        0
230 PRINT "     0        0
240 PRINT "    +
250 PRINT "    0        0
260 PRINT "
270 PRINT "     0 IIIIIII 0
280 PRINT "
290 PRINT "
300 PRINT "   0   - I - I -
310 PRINT "
320 FOR N=1 TO 50
330 NEXT N
340 PRINT AT 10,13;"
350 FOR N=1 TO 2
360 PRINT AT N,2;"
370 FOR X=1 TO 5
380 NEXT X
390 PRINT AT N,2;"   "
400 NEXT N
410 PRINT AT 2,2;"   ";TAB 2;"
"
420 RAND USR 16519
430 LET B=PEEK 32766-256*PEEK 3
2767
440 LET C=PEEK B
450 IF C<>0 THEN GOTO 500
460 LET D=D+1
470 IF PEEK 17100>50 THEN POKE
17100,PEEK 17100-10
480 PRINT AT 10,10;"WELL DONE";
AT 12,2;"YOU HAVE COMPLETED LEVE
L ";D
490 GOTO 550
500 FOR N=1 TO 30
510 IF PEEK B>=128 THEN POKE B,
C
520 IF PEEK B<128 THEN POKE B,C
+128
530 NEXT N
540 PRINT AT 10,11;"LIVES=";3-F
550 PRINT AT 3,2;"    "
560 FOR N=2 TO 1 STEP -1
570 PRINT AT N,2;"
580 FOR X=1 TO 5
590 NEXT X
600 PRINT AT N,2;"   "
610 NEXT N
620 IF PEEK B=0 THEN GOTO 100
630 NEXT F
640 LET E=0
650 LET G=10000
660 FOR N=16514 TO 16518
670 LET E=E+((PEEK N-28)*G)
680 LET G=G/10
690 NEXT N
700 IF E>A THEN LET A=E
710 PRINT AT 12,7;"ANOTHER GAME
? (Y/N)"
720 PRINT AT 10,11;"GAME OVER"
730 PRINT AT 10,11;"GAME OVER"
740 IF INKEY$="Y" THEN GOTO 20
750 IF INKEY$<>"N" THEN GOTO 72
0
760 NEW
770 SAVE "THE MINE"
780 POKE 16418,0
790 PRINT "                         
                 ";TAB 31;"  ";TAB 3
1;"          THE MINE
                 --------
    ";TAB 31;" "
800 PRINT "  YOU HAVE LANDED AT
 AN OLD       DIAMOND MINE.YOU M
UST           COLLECT ALL FIVE D
IAMONDS       AND RETURN TO YOUR
 SPACESHIP    AS QUICKLY AS POSS
IBLE.YOU   "
810 PRINT "  GET FIFTY POINTS F
OR EACH       DIAMOND COLLECTED.
              YOU MUST AVOID FAL
LING ROCKS    AND HAMMERS WHICH
WILL CRUSH  "
820 PRINT "  YOU,AND THE GUARD
WHO CHASES    YOU.HE WILL KILL Y
OU IF HE      CATCHES YOU.
              USE THE CURSOR KEY
S TO MOVE.  "
830 PRINT " ";TAB 31;"   PRESS
ANY KEY TO PLAY           ";TAB 3
1;"  ";TAB 31;"
                  "
840 IF INKEY$="" THEN GOTO 840
850 CLS
860 RUN
```

Extra colours

Tom Griffejoer, France.

BBC

THE DEMONSTRATION program, listing 1, shows how you can use 10 colours out of 36 on your Electron or BBC Micro in four colour modes and three out of 35 in two colour modes. The program doesn't work in Modes 2 and 5.

These colours can only be used as background colour, by filling a part of the screen with CHR$224, the two colours to be mixed being respectively the fore- and background colours. When you print any text over the coloured surface — in graphics mode after VDU5 — this text will be practically unreadable. That's why the second program is used. It enables you to print double-width characters. When these are printed over a coloured surface, they'll be more readable.

To see the demonstration, type in the first program and save it. Then type in the second one — don't forget to type New — and save it behind the first under the name "DPRINTrout". Now reload the first program, and Run it. It will load the second one and stop then. Type Run again to see the colours. If it does not start searching on the cassette after you've typed Run for the first time, try it again after having reset L% to 0. If it still doesn't work then, there probably is a bug in your program.

The second program can also be used on its own, in another program. You should then pass the mode in mode% and when you want the text to be printed at the graphics cursor, graphics% has to be True, otherwise False. To print something in double-width characters, type 'PROCDPRINT(X%,Y%, string$)', where X% and Y% are the co-ordinates of the first character, and string$ is the text you want to be printed. This is much like the command 'PRINTTAB(X%,Y%)string$'. To merge the second program with your program, type 'OSCLI"LOAD""DPRINTrout""+STR$~ (TOP-2)'. The computer should now start loading. When it has finished, type End, then List and the programs are merged.

Extra colours. Listing 1.

```
10REM EXTRA COLOURS
20REM (C) by Rising Sun
30REM Electron branch
40@%=&00004
50VDU23,224,&AA,&55,&AA,&55,&AA,&55,&AA,&55,23,225,
255,255,255,255,255,255,255,255:DIMcol$(7)
60nu%=1
70IFL%=1234 GOTO90ELSEL%=1234:OSCLI"LOAD"""+STR$~
(TOP-2)
80END
90PROCassemble:MODE1:VDU19,1,0;0;19,2,0;0;
100COLOUR1:COLOUR130:mode%=1:graphics%=-1
110DATAblack,red,green,yellow,blue,magenta,cyan,whit
e
120FORI%=0TO7:READcol$(I%):NEXT
130PRINT''''''STRING$(80," ")STRING$(40,CHR$224)STRI
NG$(80,CHR$225)
140COLOUR3:COLOUR128
150VDU5:GCOL0,0:PROCDPRINT(2,8,"Hello"):GCOL0,3:PROC
DPRINT(22,8,"Hello"):VDU4
160FORc1%=0TO7:FORc2%=c1%TO7
170PRINTTAB(0,13)"Number ";nu%TAB(0,14)col$(c1%)" mi
xed with "col$(c2%)"   "
180VDU19,1,c1%;0;19,2,c2%;0;
190get%=GET
200nu%=nu%+1:NEXT:NEXT
210REPEAT:PROCcol(RND(7),RND(7),RND(7),RND(7)):UNTIL
FALSE:END
220DEFPROCcol(A%,B%,C%,D%)
230CLS:PRINT'A%,B%,C%,D%'
240VDU19,0,A%;0;19,1,B%;0;19,2,C%;0;19,3,D%;0;
250FORI%=0TO3:FORJ%=0TO3:FORK%=0TO3:COLOURI%:COLOUR(
128+K%):VDU224,224,224,224:NEXT:PRINT:NEXT:NEXT:get%=G
ET:ENDPROC
```

Extra colours. Listing 2.

```
30001DEFPROCassemble
30002DIMQ%200
30003FORI%=0TO2STEP2
30004P%=Q%
30005[OPTI%
30006.def1 EQUD 0
30007.def2 EQUD 0
```

(continued on next page)

(continued from previous page)

```
30008.dpr LDA#23:JSR&FFEE:LDA#248:JSR&FFEE:LDX#0:.bigl
oop LDA#0:LDY#4:.loop ROLdef1,X:BCSverander:.resume DE
Y:BNEloop:JSR&FFEE:INX:CPX#8:BNEbigloop:JMPprint
30009.verander CPY#4:BEQfour:CPY#3:BEQthree:CPY#2:BEQt
wo
30010.one CLC:ADC#3:JMPresume
30011.two CLC:ADC#12:JMPresume
30012.three CLC:ADC#48:JMPresume
30013.four CLC:ADC#192:JMPresume
30014RTS
30015.print LDA#31:JSR&FFEE:LDA&70:JSR&FFEE:LDA&71:JSR
&FFEE:LDA#240:JSR&FFEE:RTS
30016]:NEXT
30017ENDPROC
30018
30019DEFPROCDPRINT(xx%,yy%,A$):LOCALX%
30020IFmode%=1ORmode%=4ORmode%=6 width%=40
30021IFmode%=0ORmode%=3 width%=80
30022IFmode%=2ORmode%=5 width%=20
30023IFmode%=3ORmode%=6:height%=25 ELSEheight%=32
30024FORQ%=1TOLENA$:!def1=!(&C000+8*(ASC(MID$(A$,Q%,1)
)-32)):!def2=!(&C000+8*(ASC(MID$(A$,Q%,1))-32)+4)
30025IFgraphics% GOTO30029
30026FORZ%=0TO1:?&70=xx%:?&71=yy%:CALLdpr
30027xx%=xx%+1:NEXT
30028IFxx%>=width% xx%=0:yy%=yy%+1:NEXT:PRINT:ENDPROC
ELSENEXT:PRINT:ENDPROC
30029FORZ%=0TO1:MOVE1279*(xx%/width%),1023-(1023*(yy%/
height%))
30030CALLdpr:xx%=xx%+1:NEXT:IFxx%>=width% xx%=0:yy%=yy
%+1:NEXT:PRINT:ENDPROC ELSENEXT:PRINT:ENDPROC
```

Picasso's paintbrush

Matthew Sillett,
Dulwich,
London SE21.

THE TEXT FOR this program was published in January Software File without its listing. Here is the full program. Picasso's Paintbrush is a multi-feature drawing program for the BBC Micro. Impressive pictures can be created quickly and easily using the many built-in functions.

- ☐ Automatic circle, triangle, semi-circle rectangle and elipse drawing routines
- ☐ Extensive colour mixing.
- ☐ Three cursor speeds.
- ☐ Three line thicknesses.
- ☐ Rubber band facility.
- ☐ Load and Save screens.
- ☐ Spray colour option.
- ☐ Print text anywhere on the screen.
- ☐ Colour-fill routine.
- ☐ Full MODE2 colour graphics.

The program contains full instructions of how to operate these functions and the keys involved — all 30 of them. There are three methods of colour mixing provided, all of which are very easy to use.

The first way is to fill the area involved in one of the two colours to be mixed — e.g., red — and then to overlay it with alternate pixels of the second colour — e.g., yellow. The combination of Red and yellow produces a very good orange.

The second way is the same as above, but to overlay with horizontal lines — e.g., a darker orange may be produced using this method. The final method is to use high GCOL values to produce "hatching". On pressing the specified key, you must enter this value — e.g., 198 produces a good brown, when the colour is set to white.

Copies of the program are available for £3.50 from: M. J. Sillett, 41, College Rd., Dulwich, London SE21.

```
   10REM (c)AUGUST 1984 M.J.SILLETT
   20:
   30REM N.B. To save picture hit f8,
   40REM position tape and hit RETURN
   50:
   60ONERRORRUN
   70VDU6
   80MODE2
   90VDU5:VDU6
  100X=633:Y=550:D=0:OX=X:OY=Y:OZ=X:OW=Y:PX1=-1:PY1=0:
PX2=-1:PY2=0:Q=0:G=0:U=0:y=1:col=7
  110XP=576:P=0:R=0:B=0:C=0:S=1
  120E=1:A=1:W=0
  130PROCscreen
  140VDU24,25;98;1255;1000;
  150PROCcursor(y)
  160IFX<25 X=25
  170IFX>1255 X=1255
  180IFY<98 Y=98
  190IFY>1000 Y=1000
  200VDU24,25;20;1255;1000;:GCOL0,7:MOVEXP,70:PRINTCHR
$228
  210IFXP<>128 GCOL0,0:MOVEXP-64,70:PRINTCHR$228
  220IFXP=128AND col=0GCOL0,0:MOVE1088,70:PRINTCHR$228
  230VDU24,25;98;1255;1000;
  240OX=X:OY=Y
  250IFINKEY(-26)X=X-8
  260IFINKEY(-26)AND INKEY(-1)X=X-32
  270IFINKEY(-26)AND INKEY(-98)X=X-128
  280IFINKEY(-122)X=X+8
  290IFINKEY(-122)AND INKEY(-1)X=X+32
  300IFINKEY(-122)AND INKEY(-98)X=X+128
  310IFINKEY(-58)Y=Y+4
  320IFINKEY(-58)AND INKEY(-1)Y=Y+16
  330IFINKEY(-58)AND INKEY(-98)Y=Y+64
  340IFINKEY(-42)Y=Y-4
  350IFINKEY(-42)AND INKEY(-1)Y=Y-16
  360IFINKEY(-42)AND INKEY(-98)Y=Y-64
  370IFINKEY(-33)G=0:y=1
  380IFINKEY(-114)G=0:y=0
  390IFINKEY(-115)GOSUB 700
  400IFINKEY(-116)GOSUB 710
  410IFINKEY(-21)GOSUB 720
  420IFINKEY(-117)ANDINKEY(-1)=FALSE PROCcirc(1)
  430IFINKEY(-117)ANDINKEY(-1) PROCcirc(3)
  440IFINKEY(-24)PROCelipse
  450IFINKEY(-89)PROCcirc(2)
  460IFINKEY(-72)PROCr(1)
  470IFINKEY(-73)PROCr(2)
  480IFINKEY(-118)GCOL3,128-col:CLG
  490IFINKEY(-23)y=1:PROCwrite:GOTO150
  500IFINKEY(-119)PROCsave
  510IFINKEY(-120)PROCload
  520IFINKEY(-99)col=col+1:SOUND1,-15,10,1:IFcol<>16 X
P=XP+64:GOTO150:ELSE IF col=16col=0:XP=128:GOTO150
  530IFINKEY(-97)Q=1:y=0
  540IFINKEY(-88)FX=X:FY=Y:QY=Y:PROCf
  550IFINKEY(-102)DX=X:A=POINT(X,Y):REPEAT:S=1:GCOLD,c
ol:C=POINT(X,Y):PROCp(X,Y):y=1:IFP=1ANDR=1:X=X+8:P=0:R
=0:UNTILB=1:E=0:X=DX:REPEAT:S=2:GCOLD,col:C=A:PROCp(DX
,Y):y=1:IFP=1ANDR=1:DX=DX-8:P=0:R=0:UNTILB=1:B=0:S=1:G
OTO680
  560IFINKEY(-103)DX=X:A=POINT(X,Y):REPEAT:S=1:GCOLD,c
ol:C=POINT(X,Y):PROCz(X,Y):y=1:IFP=1ANDR=1:X=X+8:P=0:R
=0:UNTILB=1:B=0:X=DX:REPEAT:S=2:GCOLD,col:C=A:PROCz(DX
,Y):y=1:IFP=1ANDR=1:DX=DX-8:P=0:R=0:UNTILB=1:B=0:S=1:G
OTO680
  570IFINKEY(-104)DX=X:A=POINT(X,Y):E=1:REPEAT:S=1:GCO
LD,col:C=POINT(X,Y):PROCb(X,Y):y=1:IFP=1ANDR=1:X=X+8:P
=0:R=0:UNTILB=1:B=0:E=1:X=DX:REPEAT:S=2:GCOLD,col:C=A:
PROCb(DX,Y):y=1:IFP=1ANDR=1:DX=DX-8:P=0:R=0:UNTILB=1:B
=0:S=1:GOTO680
  580IFINKEY(-2)Q=2:y=0
  590IFINKEY(-90)AND INKEY(-1)GOSUB 760:GOTO150
  600IFINKEY(-90)VDU21:INPUTTAB(5,1)D:VDU6:GOSUB 780:G
OTO150
  610IFINKEY(-25)GCOLD,RND(7):PLOT69,X+RND(40),Y+RND(4
0):PLOT69,X-RND(40),Y-RND(40):PLOT69,X+RND(40),Y-RND(4
0):PLOT69,X-RND(40),Y+RND(40)
  620IFINKEY(-121)GCOLD,col:PLOT69,X+RND(40),Y+RND(40)
:PLOT69,X-RND(40),Y-RND(40):PLOT69,X-RND(40),Y-RND(40)
:PLOT69,X-RND(40),Y+RND(40)
  630*FX15,0
  640IFY<90GOTO150
  650IFINKEY(-74) ANDPX1<0GOSUB730:SOUND1,-15,50,2:GOT
O150
  660IFINKEY(-74) ANDPX2<0 GOSUB740:SOUND1,-15,75,2:GO
TO150
  670IFINKEY(-74) GOSUB750:SOUND1,-15,100,2:GOTO150
  680GOTO150
  690END
  700OZ=X:OW=Y:y=1:G=1:GCOLD,col:MOVEX,Y:DRAWX,Y:RETUR
N
  710GCOLD,col:MOVEOZ,OW:DRAWX,Y:RETURN
  720GCOL0,0:MOVEOZ,OW:DRAWX,Y:RETURN
  730GCOLD,col:MOVEX,Y:DRAWX,Y:PX1=X:PY1=Y:RETURN
  740GCOLD,col:MOVEX,Y:DRAWX,Y:PX2=X:PY2=Y:U=1:RETURN
  750GCOLD,col:MOVEX,Y:DRAWPX2,PY2:PLOT85,PX1,PY1:U=0:
PX1=-100:PY1=-100:PX2=-100:PY2=-100:RETURN
  760*FX9,0
  770RETURN
  780*FX9,25
  790RETURN
  800DEFPROCscreen
  810GCOL0,7:MOVE10,5:DRAW1270,5:DRAW1270,1014:DRAW10,
1014:DRAW10,5:MOVE15,10:DRAW1265,10:DRAW1265,1009:DRAW
15,1009:DRAW15,10
  820VDU4:COLOUR7:PRINTTAB(1,30)CHR$225:FORF=0TO15:COL
```

```
OURF:PRINTTAB(2+F,30)CHR$227:NEXT:VDU5:MOVE15,85:DRAW1
265,85:MOVE15,90:DRAW1265,90
 830ENDPROC
 840DEF PROCcursor(x)
 850GCOL3,7:FORF=1TO4:MOVEX+24,Y:DRAWX-24,Y:MOVEX,Y+2
4:DRAWX,Y-24:NEXT
 860IFx=1 ENDPROC
 870IFX=OX AND Y=OY ENDPROC
 880GCOLD,col
 890IFQ=0 MOVEOX,OY:DRAWX,Y
 900IFQ=1 MOVEX-26,Y+12:PRINTCHR$224
 910IFQ=2 MOVEX-44,Y+4:PRINTCHR$226
 920ENDPROC
 930DEFPROCcirc(N)
 940*FX15,1
 950VDU21:INPUTTAB(5,1)S:VDU6:MOVEX,Y:GCOLD,col:IF N=
1FOR I%=0TO360 STEP18:MOVEX,Y:PLOT85,COSRAD(I%)*(10+S)
+X,SINRAD(I%)*(10+S)+Y:NEXT
 960IF N=2FOR I%=0TO180 STEP18:MOVEX,Y:PLOT85,COSRAD(
I%)*(10+S)+X,SINRAD(I%)*(10+S)+Y:NEXT
 970IF N=3MOVECOSRAD(0)*(10+S)+X,SINRAD(0)*(10+S)+Y:F
ORI%=0TO360:DRAWCOSRAD(I%)*(10+S)+X,SINRAD(I%)*(10+S)+
Y:NEXT
 980VDU26
 990ENDPROC
 1000DEFPROCelipse:VDU21:INPUTTAB(0,5)X%:INPUTTAB(0,5)
Y%:VDU6:GCOLD,col:MOVEX,Y:FORI%=0TO360STEP2:MOVEX,Y:PL
OT85,SIN(RAD(I%))*X%+X,COS(RAD(I%))*Y%+Y:NEXT:ENDPROC
 1010DEFPROCr(H)
 1020*FX15,0
 1030VDU21:INPUTTAB(0,5)U:INPUTTAB(0,5)V:VDU6:GCOLD,co
l:IFH=1MOVEX+U,Y-V:DRAWX+U,Y+V:DRAWX-U,Y+V:DRAWX-U,Y-V
:DRAWX+U,Y-V
 1040IFH=2MOVEX+U,Y-V:DRAWX+U,Y+V:PLOT85,X-U,Y+V:DRAWX
-U,Y-V:PLOT85,X+U,Y-V
 1050ENDPROC
 1060DEFPROCwrite
 1070*FX15,0
 1080GCOL0,col
 1090A$=GET$:MOVEX-6,Y+12:PRINTA$:X=X+64:ENDPROC
 1100DEFPROCsave
 1110VDU24,25;20;1255;1000;:GCOL0,0:MOVE XP,70:PRINTCH
R$228:XP=576:col=7:GCOL0,7:MOVE XP,70:PRINTCHR$228:VDU
24,25;98;1255;1000;
 1120*SAVE SCREEN 3000 8000
 1130ENDPROC
 1140DEFPROCload
 1150*LO. SCREEN
 1160VDU24,25;20;1255;1000;:GCOL0,0:MOVE XP,70:PRINTCH
R$228:VDU24,25;98;1255;1000;
 1170y=1:X=633:Y=505:XP=576:col=7
 1180ENDPROC
 1190DEFPROCb(x,y)
 1200G=E
 1210q=y:z=y
 1220IFS=1 IFPOINT(x+8,y)<>C D=1
 1230IFS=2 IFPOINT(x-8,y)<>C D=1
 1240REPEAT
 1250IFPOINT(x,q+4)<>C:P=1
 1260IFPOINT(x,z-4)<>C:R=1
 1270IFc=y AND E=2 ANDINKEY(-74)=FALSE MOVE x,y:PLOT69
,x,y
 1280IFP=0ANDE=1:MOVE x,q:PLOT69,x,q+4
 1290IFR=0ANDE=1:MOVE x,z:PLOT69,x,z-4
 1300q=q+4:z=z-4
 1310IFINKEY(-74)P=1:R=1:O=1
 1320E=E+1:IFE=3 E=1
 1330UNTILP=1 AND R=1
 1340IFG=1 E=2
 1350IFG=2 E=1
 1360IFO=1 B=1:O=0
 1370ENDPROC
 1380DEFPROCf
 1390GCOLD,col
 1400REPEAT
 1410PLOT77,FX,FY
 1420FY=FY+4
 1430UNTILPOINT(FX,FY)<>0
 1440REPEAT
 1450PLOT77,FX,QY
 1460QY=QY-4
 1470UNTILPOINT(FX,QY)<>0
 1480ENDPROC
 1490DEFPROCz(x,y)
 1500q=y:z=y
 1510IFS=1 IFPOINT(x+8,y)<>C O=1
 1520IFS=2 IFPOINT(x-8,y)<>C O=1
 1530REPEAT
 1540W=W+1
 1550IFP=0AND W=1 MOVE x,c:PLOT69,x,q
 1560IFR=0AND W=1 MOVE x,z:PLOT69,x,z
 1570IFPOINT(x,q+4)<>C:P=1
 1580IFPOINT(x,z-4)<>C:R=1
 1590q=q+4:z=z-4
 1600IFINKEY(-74)P=1:R=1:O=1
 1610IFW=2W=0
 1620UNTILP=1 AND R=1:W=0
 1630IFO=1 B=1:O=0:E=2
 1640ENDPROC
 1650DEFPROCp(x,y)
 1660q=y:z=y
 1670IFS=1 IFPOINT(x+8,y)<>C O=1
 1680IFS=2 IFPOINT(x-8,y)<>C O=1
 1690REPEAT
 1700W=W+1
 1710IFP=0MOVE x,q:PLOT69,x,q
 1720IFR=0MOVE x,z:PLOT69,x,z
 1730IFPOINT(x,q+4)<>C:P=1
 1740IFPOINT(x,z-4)<>C:R=1
 1750q=q+4:z=z-4
 1760IFINKEY(-74)P=1:R=1:O=1
 1770UNTILP=1 AND R=1
 1780IFO=1 B=1:O=0:E=2
 1790ENDPROC
```

Artist

John McHale,
Sligo,
Eire.

CBM-64

THIS PROGRAM USES the CBM-64's hi-resolution graphics facilities and enables you to draw impressive pictures on screen with the added bonus of being able to save any picture created, to tape with the touch of one key.

```
0 REM * BASIC LOADER FOR MACHINE CODE *
1 REM ******************
2 REM * JOYSTICK ART.. *
3 REM * FOR THE CBM 64 *
4 REM * WRITTEN BY     *
5 REM * JOHN MC HALE   *
6 REM * SLIGO,EIRE.....*
7 REM ******************
8 PRINT"THIS PROGRAM USES A JOYSTICK IN PORT  2.":FORT=0TO2000:NEXT
10 C=C+1 IFC=2THENSYS49588
20 PRINT" PLEASE WAIT , LOADING  'ARTIST CBM 64' "
30 FORT=0TO2000:NEXT
40 LOAD"",1,1
```

```
10 REM * PROGRAM 2 , HEX CODE LOADER *
12 GOSUB500
100 ADD=49152:TL=0 :PRINT"PLEASE WAIT , LOADING MACHINE CODE NOW ."
110 READHX$:IFHX$="XX"THEN200
120 FORT=0TO7
130 H=ASC(MID$(HX$,T*2+1,1))-48:IFH>9THENH=H-7
140 L=ASC(MID$(HX$,T*2+2,1))-48:IFL>9THENL=L-7
150 POKEADD+T,H*16+L:TL=TL+H*16+L:NEXT:ADD=ADD+8:GOTO110
200 IFADD<>50072THENPRINT"INSUFFICIENT DATA !":STOP
210 IFTL<>124790THENPRINT"ERROR IN DATA INPUT !":STOP
220 PRINT" THE DATA HAS BEEN SUCCESFULLY ENTERED  ";
230 PRINT"AND HAS BEEN LOADED INTO MEMORY FROM  "
240 PRINT"49152 ($C000) ONWARDS .
250 PRINT"YOU NOW HAVE THE FOLLOWING OPTIONS :"
260 PRINT:PRINT"1. SAVE THE MACHINE CODE TO TAPE"
270 PRINT:PRINT"2. END THIS PROGRAM"
280 PRINT:PRINT
290 INPUT"OPTION NO.";OPT
300 IFOPT<>1ANDOPT<>2THEN290
310 IFOPT=1THEN500
320 PRINT"HAS THE MACHINE CODE BEEN SAVED (Y/N)"
330 POKE197,64:GETAN$:IFAN$=""THEN330
340 IFAN$<>"Y"THEN220
350 SYS64738
500 PRINT" SAVING MACHINE CODE TO TAPE::::::::::"
510 PRINT"NOTE: YOU SHOULD SAVE THE MACHINE CODE"
520 PRINT"ON THE SAME TAPE AS PROGRAM1 IE. THE"
530 PRINT"THE BASIC LOADER, MAKING SURE TO WIND"
540 PRINT"THE TAPE FORWARD A FEW TAPE COUNTS PAST"
550 PRINT"THE END OF PROGRAM 1, IN ORDER TO AVOID"
560 PRINT"ANY OVERLAP WHICH CAN CAUSE LOAD ERRORS"
570 PRINT:PRINT"PLACE CASSETTE IN RECORDER."
579 GOTO630
580 FORT=0TO51:READMC:POKE50176+T,MC:NEXT
585 RETURN
590 DATA169,0,133,248,169,192,133,249,169,160,133,250,165,195
600 DATA133,251,169,1,170,168,32,186,255
610 DATA169,10,162,42,160,196,32,189,255
620 DATA166,250,164,251,169,248,32,216,255,96,65,82,84,73,83,84,45
630 POKE788,52:PRINT"PRESS 'F1' TO CONTINUE WITH SAVE. ANY"
635 DATA52,54,46
640 PRINT"OTHER TO ABANDON OPTION 1"
650 GETAN$:IFAN$=""THEN650
660 IFAN$<>"■"THEN220
670 SYS50176:GOTO220
959 REM * SPRITE DATA     *
```

(continued on next page)

(continued from previous page)

```
1000 DATA00000CC18300C300
1001 DATA00220C0003000022
1002 DATA0000630000C18000
1003 DATA0000000000000000
1004 DATA0000000000000000
1005 DATA0000000000000000
1006 DATA0000000000000000
1007 DATA0000000000000000
1008 REM ::::::::::::::::
1999 REM * MACHINE CODE DATA *
2000 DATAA2408IFFBF9D3F03
2001 DATACA00F760A0008DFC
2002 DATACF8DFFCFA0000C4A
2003 DATA8005A0018CFECF4A
2004 DATA8005A0028CFECF4A
2005 DATABA05A0298EFCF4A
2006 DATAB005A2018EFECF4A
2007 DATAB006A5018DFDCF60
2008 DATAA9008DFDCF60A900
2009 DATA85F8A92085F9A000
2010 DATA4A0009IF8E6F8D0FA
2011 DATA4E6F9A5F9C940D0F0
2012 DATA60AD15D00901BD15
2013 DATA4D0A9188D00D0DF8
2014 DATA4CFA9328D01D0DF9
2015 DATA4CFA9008DFCCFF900
2016 DATA48DFACFA9208DFBCF
2017 DATA2040C0A90D8DF007
2018 DATAA9048DF7CF60FDFE
2019 DATACFD003EAEAEAC901
2020 DATAD036ADF9CF30E901
2021 DATAC931D0019008F9CF
2022 DATAB0110ADF7CF30E9
2023 DATA01C9FFD017A9078D
2024 DATAF7CFFDFACF30E940
2025 DATA8DFACFAD F8CFE901
2026 DATA8DFBCF603DF7CF60
2027 DATAC9021OFBADF9CF15
2028 DATA6901C9F2000160BD
2029 DATAF9CF8D01D0A1F7CF
2030 DATA1869C1C998D017A9
2031 DATA000DF7CFADFACF18
2032 DATA69408DFACFA1FBCF
2033 DATA69018DFBCF608DF7
2034 DATACF60ACF7CFADFACF
2035 DATA85F8ADFBCF85F9D1
2036 DATAF8DFCCF91F0A20F
2037 DATAA0008DFDCFADDF8
2038 DATAEAEAEAEAEAEAEAEA
2039 DATAEFFAA011A0092003
2040 DATA11D0AD1820090083
2041 DATA1E006ADFFCFD001
2042 DATA6EC901D038AD10D0
2043 DATA2501F815ADF8CF18
2044 DATA6501C94F20016083
2045 DATAFECF800020 11C2
2046 DATA6EADF9CF18690190
2047 DATA0F40AD10D0090183
2048 DATA10D068DF8CF3D00
2049 DATAD0201IC260C902D0
2050 DATAF8AD10D02901F024
2051 DATAADF8CF38E901B012
2052 DATA8DF8CF8D0FA0A11A
2053 DATAD029FE8D1ED02033
2054 DATAC2600DF8CF8D00D0
2055 DATA2033C260AIF8CF38
2056 DATAE901C9.71001600D
2057 DATAF0CF0D00D2033C2
2058 DATA60ADFCCF1D4A2004
2059 DATA8DFCCF60A9008DFC
2060 DATACFADFACF1869008D
2061 DATAFACF-ADFBCF69008D
2062 DATFBCF60ADFCCF100A
2063 DATF00048DFCCF60A901
2064 DATF0DFCCFADFACF38E9
2065 DATF008DFACFADFBCF E9
2066 DATF008DFBCF60A5C5C9
2067 DATF03D0072OD5C22040
2068 DATFC063C904D0122086
2069 DATACOAD1OIO2 E0D10
2070 DATAD029A1C020AC160
2071 DATAC205D0420ABC360
2072 DATAC906D0FDEC022094
2073 DATAC200EAEAEAEAEAEA
2074 DATAEAEAEAEAEAEAEAEA
2075 DATAEAEAA9C085 8A904
2076 DATA85F9A000A5291F8
2077 DATAFAF8A0AF4F900F9
2078 DATAC908D0F0A90D0IF8
2079 DATA0760A1FACF85F8AD
2080 DATAFBCF85F9ACF7CFA9
2081 DATA0091FE6048492052
2082 DATA45532041525441 11
2083 DATAD029DF8D11D0F018
2084 DATAD029F70D18D0F900
2085 DATA8D:5140C932012FF
2086 DATAA9A085F885FAF920
2087 DATA85F9A94085FBF901
2088 DATA0291A0012000FFA9
2089 DATA0AA2C0A0C220IDFF
2090 DATA46FAA4FBA9F020D0
2091 DATAFFA9018D15D02040
2092 DATAC0A901DF8 7A993
2093 DATA2012FFA000A200CA
2094 DATADF D0 0EAEAEA
2095 DATA0 0 1D1D020A1C0
2096 DATA207AC1502040C0A9
2097 DATA01DF837A9008D10
2098 DATAD0207AC1EAEAEA20
2099 DATAA11U204UCU2D1DC0
2100 DATA20 BC1ADF DCFF003
2101 DATA20C2C12055C2A9
2102 DATAA2F0CA00FD080F8
2103 DATA CAC3A0FACF85
2104 DATA
2105 DATA00 1F 0 0DF9
2106 DATA0000000000000000
2107 REM
2108 DATA0
```

Lander

David Hodgetts,
Tipton,
West Midlands.

VIC-20

LANDER IS a game for the unexpanded Vic-20 and a joystick. The game comes in six parts, the first is a loading screen, the next four are for the machine code and graphics, and the last part is the actual game.

The idea of the game is to guide your landing craft through an asteroid belt and land it safely on the pad below. To make things more difficult there is a time limit which is displayed at the bottom of the screen, try and be as fast as possible as your score is based on how much time you have left after landing your craft. As you drop the speed of your craft increases, so if you want to slow your descent you can thrust by pulling back the joystick, but you cannot go upwards.

At the start of the game there is a title page with two options, F1 for the start velocity of the landing craft, and F3 for the asteroid speed. As the levels get higher the asteroids get faster, but the start velocity of your craft remains constant.

Type in and save each of the programs, in order, one after the other, and load using shifted run-stop. Each of the data programs has a check sum to make sure that the data is correct, as if there is a mistake in the data it could cause the program to crash, so if you get a data error re-check the data and re-save the corrected version.

If there are no data errors then each program will load the next. After each part has finished loading then the border colour of the screen will change.

Program 1.

```
10 POKE36879,8:PRINT"Ͻ"
20 PRINT"LANDER":PRINT"BY DAVID HODGETTS"
30 PRINT"(C) 1984"
40 PRINT"PLEASE WAIT..."
50 FORA=0TO9 POKE631+A,PEEK(60916+A):NEXT POKE198,9
```

Program 2.

```
100 S=7168:FORI=STOS+511:READX:C=C+X:POKEI,X:NEXT
110 IFC<>36511THENPRINT"DATA ERROR!!":END
120 DATA3,15,31,50,50,63,50,18
130 DATA152,240,248,76,76,252,76,72
140 DATA31,7,13,25,49,49,49,49
150 DATA248,224,176,152,140,140,140,140
160 DATA34,4,17,4,0,3,0,1
170 DATA132,16,64,0,160,0,128,0
180 DATA0,1,7,31,60,57,123,127
190 DATA0,160,240,223,158,160,230,199
200 DATA125,239,231,247,127,121,29,7
210 DATA255,207,190,250,242,228,216,40
220 DATA16,50,127,255,255,255,255,255
230 DATA255,255,255,255,255,255,255,255
240 DATA12,16,38,72,147,164,41,10
250 DATA40,A,100,18,201,37,148,80
260 DATA10,41,164,147,72,38,16,12
270 DATA80,148,37,201,18,100,8,40
280 DATA24,24,24,60,36,60,36,90
290 DATA102,66,126,66,255,129,255,255
300 DATA0,0,0,0,0,0,0,0
310 DATA0,0,0,0,0,0,0,0
320 DATA0,0,0,0,0,0,0,0
330 DATA0,0,0,0,0,0,0,0
340 DATA0,0,0,0,0,0,0,0
350 DATA0,0,0,0,0,0,0,0
360 DATA0,0,0,0,0,0,0,0
370 DATA0,0,0,0,0,0,0,0
380 DATA0,0,0,0,0,0,0,0
390 DATA0,0,0,0,0,0,0,0
400 DATA0,0,0,0,0,0,0,0
410 DATA0,0,0,0,0,0,0,0
420 DATA0,0,0,0,0,0,0,0
430 DATA0,0,0,0,0,0,0,0
440 DATA0,0,0,0,0,0,0,0
450 DATA255,0,0,0,0,0,0,255
460 DATA255,0,128,128,128,128,0,255
470 DATA255,0,192,192,192,192,0,255
480 DATA255,0,224,224,224,224,0,255
490 DATA255,0,240,240,240,240,0,255
500 DATA255,0,248,248,248,248,0,255
510 DATA255,0,252,252,252,252,0,255
520 DATA255,0,254,254,254,254,0,255
530 DATA255,0,255,255,255,255,0,255
540 DATA0,0,0,0,0,0,0,0
550 DATA0,0,0,0,0,0,0,0
560 DATA0,0,0,0,0,0,0,0
570 DATA0,0,0,0,0,0,0,0
580 DATA0,0,0,0,0,0,0,0
590 DATA0,0,0,0,0,0,0,0
600 DATA0,0,0,0,0,0,0,0
610 DATA0,0,0,0,0,0,0,0
620 DATA0,0,0,0,0,0,0,0
630 DATA0,0,0,0,0,0,0,0
640 DATA160,0,169,10,153,206,31,169
650 DATA5,153,206,151,152,201,5,144
660 DATA10,169,41,153,228,31,169,2
670 DATA153,228,151,200,192,22,208,226
680 DATA96,0,0,0,0,0,0,0
690 DATA0,0,0,0,0,0,0,0
700 DATA162,0,254,44,150,189,44,150
710 DATA41,8,240,5,169,1,157,44
720 DATA150,232,224,110,208,236,96,169
730 DATA23,133,55,133,52,96,169,255
740 DATA141,5,144,169,8,141,15,144
750 DATA96,0,0,0,0,0,0,0
800 POKE36879,10:PRINT""
810 FORA=0TO9 POKE631+A,PEEK(60916+A):NEXT:POKE198,9
```

Program 3.

```
100 S=6656:FORI=STOS+511:READX:C=C+X:POKEI,X:NEXT
110 IFC<>50002THENPRINT"DATA ERROR!!":END
120 DATA160,0,177,1,201,5,176,15
130 DATA200,192,2,208,245,160,22,177
140 DATA1,201,6,176,13,200,192,24
150 DATA208,245,96,201,32,240,233,76
160 DATA82,26,201,32,240,239,76,82
170 DATA26,96,160,0,169,32,145,1
180 DATA200,145,1,160,22,145,1,200
190 DATA145,1,173,53,3,240,18,160
200 DATA44,173,54,3,145,1,173,55
210 DATA3,200,145,1,169,0,141,53
220 DATA3,96,141,56,3,201,11,208
230 DATA15,56,165,1,233,22,176,2
240 DATA198,2,133,1,32,172,26,234
250 DATA120,162,191,160,234,142,20,3
250 DATA140,21,3,88,96,173,53,3
270 DATA240,13,160,44,173,54,3,145
230 DATA1,200,173,55,3,145,1,160
290 DATA0,169,12,145,1,152,2,32
300 DATA226,27,200,169,13,192,2,208
310 DATA242,160,22,169,14,145,1,162
320 DATA2,32,226,27,200,169,15,192
```

SOFTWARE FILE

```
330 DATA24,208,242,96,173,53,3,240
340 DATA13,160,44,173,54,3,145,1
350 DATA200,173,55,3,145,1,96,0
360 DATA169,176,162,4,221,6,30,208
370 DATA5,202,224,255,208,246,162,4
380 DATA254,6,30,169,186,221,5,30
390 DATA208,10,169,176,157,6,30,202
400 DATA224,255,208,236,96,162,0,32
410 DATA245,25,189,0,150,41,8,240
420 DATA5,159,7,32,151,25,232,224
430 DATA22,208,236,96,0,0,0,0
440 DATA162,32,160,30,134,1,132,2
450 DATA169,1,141,52,3,169,0,141
460 DATA53,3,141,56,3,120,162,34
470 DATA160,27,142,20,3,140,21,3
480 DATA88,96,120,32,0,26,206,52
490 DATA3,240,3,76,36,24,169,16
500 DATA141,52,3,173,47,27,201,4
510 DATA144,3,205,47,27,32,42,26
520 DATA169,0,141,19,145,169,127,141
530 DATA34,145,159,16,44,17,145,208
540 DATA10,198,1,165,1,201,255,208
550 DATA2,198,2,169,128,44,32,145
560 DATA208,6,230,1,208,2,230,2
570 DATA24,165,1,105,22,144,2,230
580 DATA2,133,1,169,8,44,17,145
590 DATA208,36,238,47,27,238,47,27
600 DATA173,47,27,201,32,144,5,169
610 DATA32,141,47,27,160,44,177,1
620 DATA141,54,3,200,177,1,141,55
630 DATA3,169,1,141,53,3,32,0
640 DATA26,160,0,152,145,1,162,3
650 DATA32,226,27,200,192,2,208,243
660 DATA160,22,169,2,145,1,162,3
670 DATA32,226,27,169,3,203,192,24
680 DATA208,242,173,53,3,240,23,160
690 DATA44,169,4,234,145,1,162,2
700 DATA32,226,27,200,169,5,234,145
710 DATA1,162,2,32,226,27,76,36
720 DATA24,0,165,1,141,242,27,155
730 DATA2,41,3,9,148,141,243,27
740 DATA138,153,119,150,96,0,0,0
750 DATA0,0,0,0,0,0,0,0
800 POKE36879,12:PRINT"■■■■■■■■"
810 FORA=0TO9:POKE631+A,PEEK(60916+A):NEXT:POKE198,9
```

Program 4.

```
100 S=6400:FORI=STOS+255:READX:C=C+X:POKEI,X:NEXT
110 IFC<>25259THENPRINT"DATA ERROR!!":END
120 DATA173,53,3,240,18,160,0,185
130 DATA54,3,201,6,240,242,201,7
140 DATA240,238,200,192,2,208,240,162
150 DATA43,160,30,134,3,132,4,160
160 DATA1,140,60,3,177,3,201,6
170 DATA240,15,200,192,23,208,242,32
180 DATA196,25,165,4,201,32,208,231
190 DATA96,32,160,25,24,165,3,105
200 DATA22,144,2,230,4,133,3,172
210 DATA60,3,32,160,25,172,60,3
220 DATA136,208,2,160,22,140,61,3
230 DATA165,8,145,3,32,176,25,200
240 DATA192,25,208,2,160,1,169,9
250 DATA145,3,32,176,25,56,165,3
260 DATA233,22,176,2,198,4,133,3
270 DATA172,61,3,169,6,145,3,32
280 DATA176,25,200,192,24,208,2,160
290 DATA1,169,7,145,3,32,176,25
300 DATA172,60,3,76,42,25,0,157
310 DATA0,150,157,228,151,96,0,0
320 DATA169,32,145,3,200,192,24,208
330 DATA2,160,1,145,3,96,0,0
340 DATA165,3,141,193,25,165,4,41
350 DATA3,9,148,141,194,25,169,2
360 DATA153,249,151,96,165,3,24,105
370 DATA56,144,2,230,4,133,3,96
380 DATA160,0,169,32,153,22,30,153
390 DATA206,30,169,1,153,22,150,153
400 DATA206,150,136,208,237,96,165,1
410 DATA141,251,24,165,2,41,3,9
420 DATA148,141,252,24,96,222,0,150
430 DATA222,228,151,96,0,0,0,0
800 POKE36879,13:PRINT"■■■■■■■■"
810 FORA=0TO9:POKE631+A,PEEK(60916+A):NEXT:POKE198,9
```

Program 5.

```
100 S=6144:FORI=STOS+255:READX:C=C+X:POKEI,X:NEXT
110 IFC<>27675THENPRINT"DATA ERROR!!":END
120 DATA160,0,185,22,30,201,7,208
130 DATA7,169,6,136,153,22,30,200
140 DATA185,242,30,201,7,208,7,169
150 DATA6,136,153,242,30,200,200,192
160 DATA242,208,223,96,206,63,3,240
170 DATA3,76,191,234,162,3,142,63
180 DATA3,174,62,3,222,232,31,189
190 DATA232,31,201,33,208,13,206,62
200 DATA3,208,8,32,104,26,162,255
210 DATA142,56,3,76,191,234,0,0
220 DATA162,160,142,10,144,32,120,24
230 DATA174,62,3,222,232,31,189,232
240 DATA31,201,33,208,5,206,62,3
250 DATA240,25,32,192,26,162,192,142
260 DATA10,144,32,120,24,76,80,24
270 DATA162,16,160,255,136,208,253,202
280 DATA208,250,96,238,62,3,162,128
290 DATA142,10,144,32,120,24,174,62
300 DATA3,254,232,31,189,232,31,201
310 DATA41,144,10,238,62,3,173,62
320 DATA3,201,18,240,11,162,176,142
330 DATA10,144,32,120,24,76,134,24
340 DATA162,0,142,10,144,96,173,53
350 DATA3,240,6,162,128,142,13,144
360 DATA96,162,0,142,13,144,96,160
370 DATA0,169,2,32,250,24,160,23
380 DATA32,250,24,160,1,169,7,32
390 DATA250,24,160,22,32,250,24,96
400 DATA160,1,169,2,32,250,24,160
410 DATA22,32,250,24,160,0,169,7
420 DATA32,250,24,160,23,32,250,24
430 DATA96,0,153,119,150,96,0,0
800 POKE36879,14:PRINT"■■■■■■■■"
810 FORA=0TO9:POKE631+A,PEEK(60916+A):NEXT:POKE198,9
```

Program 6.

```
10 SYS7655:A$="■■■■■■■■■■■■■■■■■■■■■■":GOSUB500:SYS7662
20 PRINT"■■SCORE:00000":4=15-S
30 SYS7504:POKE6959,20-V:T=0
40 POKE830,17:POKE831,2:POKE36878,15
50 E=INT(RND(1)*15)
60 PRINTA$,"■■TIME:■"
70 PRINTA$"■"SPC(E)"■■■■■■■■■  ■■■■■■■  ■■"
80 FORA=3TO20STEP3
85 X=INT(RND(1)*15):IF(X>Y-3ANDX<Y+3)OR(A=3ANDX>7ANDX<14)THEN85
90 PRINTLEFT$(A$,A);TAB(X);"■■■■■■■":Y=X:NEXT
100 SYS6912
120 P=PEEK(824):IFP<>0ANDP<>1THENSYS6773:GOTO220
125 SYS6926:IFP=1THEN200
126 T=T+1:IFT=4THENSYS6400:T=0
130 SYS6144:GOTO120
200 PRINTA$"■"SPC(E)"■■■■■■■■■■■■■■■■■■■■■■■■":W=W-2:IFW<1THENW=1
210 POKE36877,0:SYS6224:SYS6400:GOTO30
220 SYS6630:POKE36877,160:FORA=15TO0STEP-1
230 POKE36878,A:SYS6350:FORS=0TO150:NEXT
240 SYS6343:FORS=0TO130:NEXT:NEXT
244 POKE36877,0:LV=LV+1:IFLV<3THENSYS6600:GOTO30
250 PRINTLEFT$(A$,11)SPC(6)"■■GAME OVER":FORA=0TO5000:NEXT:RUN
500 POKE36879,14:POKE36869,240:PRINT"■"
510 FORA=0TO21:POKE7680+A,160:POKE38400+A,AAND7
520 POKE8164+A,160:POKE38884-A,AAND7:NEXT
530 PRINT"■■■■■■■■ ■■■ ■■■ ■■■ ■■■  "
531 PRINT"■■■■■■■■■■■■ ■■■■ ■■ ■■■■■   ■■■■■ ■■ ■■■■■ ■■ "
532 PRINT"■■■";SPC(7);"■■  ■■■ ■■■■■■■ ■■ ■■ ■■■■■■■ ■■ ■■ ■■■■■■■ ■■■  ■■■■■■■ ■■■■ "
533 PRINT"■■■";SPC(12);"■■  ■■■■ ■■ ■■■■■ ■■ ■■■■■ ■ ■■■■  "
534 PRINT"■■■";SPC(15);"■■  ■■■■ ■■■  ■■■■ ■■■  "
535 PRINT"■■■";SPC(17);"■■  ■■■■ ■■ ■■■■■  ■■■■ ■■ ■■■■ ■■ "
536 PRINTLEFT$(A$,10)"■■■BY DAVID HODGETTS."
537 PRINTLEFT$(A$,21)"■■■■PRESS FIRE TO PLAY"
540 PRINTLEFT$(A$,14)"■  START VELOCITY:";V
550 PRINTLEFT$(A$,17)"  ASTEROID SPEED:";S
560 GETC$:IFC$="■"THENV=V+1:IFV>9THENV=0
570 IFC$="■"THENS=S+1:IFS>9THENS=0
580 SYS6885:SYS7632:FORD=0TO150:NEXT
590 IF(PEEK(37151)AND32)<>0THEN540
600 RETURN
```

Toolkit

H Geradts,
The Hague,
The Netherlands.

SPECTRUM

TOOLKIT COMBINATION is a machine-code program which allows the user of the ZX-Spectrum with only one USR instruction to get a variety of information about a Basic program as well as about one written in machine code. Several of the routines have been published before, but the disadvantage of these is that you have to keep track of a series of addresses.

Access of a machine-code instruction directly from Basic as was done in the program published in *Your Computer*, September 1983 by Gary Rees causes troubles because the Spectrum seems to dislike the IM2 instruction.

Toni Baker warns against using the IM instruction on page 102 of her book on machine code. After some time a system hang-up appears to occur. Nevertheless, Gary Rees' program is quite interesting because it gives a useable way of printing numbers on screen.

The same method has been used in this program: the program gives a menu of the options — analyse memory, the hex/dec, dec/hex converter and some smaller routines are adapted from the program Supercode by CP-Software and are published with its

(continued on page 134)

(continued from page 133)

permission. Now a short description of these options.

Analyse Memory: This gives the address you have chosen, the decimal value, the hexadecimal value and the character — where printable — in the address. You can choose the first address by Randomise no: USR! — address. All the following addresses are printed until the screen is full. The Scroll? message is then printed. If you press n you are back in Basic, but it is possible to get the menu back if you have put the instruction:

RANDOMIZE USR 64360 in a Basic line

The options Memory free, Proglength, Varlength, Pro. + vars do not need any explanation. Neither does the option Ramtop. You have only to press the letter behind these options to see the value of these parameters printed on the screen.

The second option in the menu is Frames + sound. This is not a very useful routine but more something like a demonstration that Spectrum does have a clock inside.

You can get back to the menu by pressing Z. Z is also used to get back to Basic. That is the way to get into Basic without Caps Lock, because the machine-code is programmed to be used with capitals. It has other features, which I hope you will like: Paper and Border blue, Ink white and a more audible sound from the keyboard. These are permanent in Basic until you change them back. With Interface 1 connected CLS # will change the colours to black and white.

Breaking out of the machine-code with Caps Lock-Break is possible too. There are three other options which I didn't mention. Line address, UDG, and 3. The first is quite straightforward. Put the cursor in a Basic line, and L will tell you the address of the first character the cursor points to. Easy to see where a Basic program ends. UDG again uses the variable Seed. If you have your own UDGs somewhere in memory, e.g. 40000, use Randomize 40000, go to the menu and press U. To get back to the Spectrum UDGs you can use the S.

The last option is pressing 3. This is not mentioned in the menu. It sets the Microdrive variables — with Interface 1 connected — and gives a yellow flashing Border when Saving etc on Microdrives.

Now for the Basic program. The machine-code is exactly 1000 bytes long. Each Data statement is one hundred bytes. Type it in and run it. Three things can happen. You have all the numbers typed in correctly — congratulations, I never succeed in doing that. Then the program will run to the end. If on the other hand you forget a number or type more than 100 numbers in one statement you can expect the Spectrum to give the somewhat unfriendly message "Nonsense in Basic", because it is reading a numerical Data instead of a string variable. Another possibility is typing a wrong number.

The program then gives the Line in which the error has occurred. It contains no safeguards against typing two or more faulty numbers, if the sum is the same as that of the correct ones. So it is advisable to Save the Basic program before trying the machine code. Once the machine code works as expected, you can New the program, but make sure first that machine code is Saved. Never try to load the machine-code before lowering Ramtop — Clear 64359.

```
   1 REM Toolkit combination by
         H. Geradts, The Hague,
         The Netherlands
         This program contains
         several routines from
         "SUPERCODE" BY
         CP SOFTWARE ENGLAND
   2 CLEAR 64359
   3 RUN 1000
  50 DATA 205,164,253,24,9,225,1
26,35,229,167,200,215,24,247,176
,58,60,92,205,109,251,17,2,16,7,
65,110,97,108,121,115,101,32,109
,101,109,111,114,121,58,32,65,13
,73,114,97,109,101,115,43,115,11
1,117,110,100,58,32,70,43,81,10,
62,202,97,100,100,114,101,115,11
5,58,6,76,13,77,101,109,111,114,
121,32,102,114,101,101,58,6,77,1
3,80,114,111,103,108,101,110,103
,116,104,58
  51 DATA "9692"
  52 DATA 6,80,13,80,114,111,103
,32,43,32,118,97,114,115,58,6,84
,13,82,97,109,116,111,112,58,6,8
2,13,86,97,114,108,101,110,103,1
16,104,58,6,86,13,85,68,71,58,24
9,6,32,13,97,100,100,114,101,115
,116,5,85,13,85,66,71,32,83,112
101,99,116,114,127,109,56,6,83,1
3,72,101,120,45,62,68,56,72,69,6
8,101,99,45,62,72,58,68,13,69,12
0,105,116,40,108,46
  53 DATA "7649"
  54 DATA 99,97,115,101,41,58,6,
90,22,14,10,16,1,62,62,6,229,176
,62,6,216,175,17,156,0,33,100,0,
205,101,3,253,203,1,174,253,203,
1,110,42,250,58,8,92,211,63,254,
90,202,172,252,254,76,202,32,253
,254,72,202,55,254,254,66,202,19
7,253,254,66,202,165,264,254,60,
40,98,254,77,40,108,254,81,204,1
61,264,254,82,202,24,253,254,86,
40,100,254,04,40,62,254,65,40
  55 DATA "12629"
  56 DATA 34,254,83,40,39,254,70
,40,106,197,205,142,2,193,33,32,
39,167,237,82,40,11,24,173,245,1
75,50,106,92,241,195,96,253,225,
201,42,110,92,34,123,92,215,24,1
30,42,180,92,17,167,0,237,82,34,
123,62,215,106,66,252,205,153,26
3,42,89,92,237,91,83,92,237,82,2
4,80,205,153,253,42,76,92,237,91
,83,62,237,82,24,66,205,153,253,
42,178,92,237,91,101,92,237,82,2
4
  57 DATA "12319"
  58 DATA 52,205,153,253,237,91,
75,92,42,89,92,237,82,24,38,215,
205,154,253,42,161,92,245,126,21
1,63,241,42,120,92,24,21,205,153
,253,42,178,92,24,13,205,153,253
,42,73,92,205,110,25,35,35,36,38
,1,240,216,206,126,253,1,24,282,
206,105,253,1,156,255,205,105,25
3,246,255,205,105,253,1,255,25
3,205,105,253,253,203,1,110,40,3
30,58,8,92,254,70,40,176,254,81,
202,10
  59 DA"A "13363"
  60 DA"A 255,195,66,252,253,33,
58,92,226,241,251,207,255,76,9,
60,56,252,237,66,61,198,48,229,2
05,131,253,33,249,91,52,42,249,9
1,205,144,253,225,201,237,75,54,
92,36,0,111,41,41,41,69,235,201,
6,6,26,119,36,19,16,250,201,215,
33,205,72,34,249,91,33,0,0,201,6
2,8,50,106,92,62,56,50,57,92,62,
1,211,254,62,15,50,141,92,50,72,
92,211,127,205,107,13,62
  61 DATA "11648"
  62 DATA 2,205,1,22,201,205,188
,253,62,68,215,62,58,215,239,160
,56,205,142,2,123,254,255,32,248
,205,142,2,32,251,22,0,205,30,3,
48,244,254,13,40,26,254,90,40,71
,254,48,56,224,254,58,48,220,245
,215,241,205,34,45,239,1,164,4,1
5,56,24,205,205,162,45,56,38,62,
32,215,62,61,215,62,32,215,237,6
7,254,91,6,4,175,33,254,91,237,1
11,36,237,111,198,48,254,56
  63 DATA "12254"
  64 DATA 48,10,215,16,238,62,13
,215,24,154,207,5,198,7,24,242,1
65,164,251,205,196,253,62,72,216
,62,58,215,33,251,91,54,0,35,54,
0,205,142,2,123,254,255,32,248,2
05,142,2,32,251,22,0,205,30,3,48
,244,254,13,40,41,254,90,40,208,
254,48,56,224,254,71,48,220,254,
58,56,4,254,65,56,212,245,215,24
1,214,48,254,10,56,2,214,7,33,25
4,91,237,111,35,237,111,24
  65 DATA "12237"
  66 DATA 191,62,32,215,62,61,21
5,62,32,215,237,75,254,91,205,43
,45,205,227,45,62,13,215,24,153,
17,6,1,33,200,0,205,181,3,62,35,
205,153,253,207,49,62,6,50,198,9
2,195,66,252,205,188,253,42,116,
92,235,33,177,92,66,75,229,213,2
05,43,45,205,227,45,209,225,62,3
2,215,56,119,43,54,0,206,40,26,6
2,32,215,62,32,219,26,5,2,175,23
7,111,198,48,254,58,48,22
  67 DATA "11415"
  68 DATA 215,16,244,62,32,215,6
2,32,215,235,126,254,32,56,11,21
5,52,13,215,35,24,189,198,7,24,2
30,62,63,24,241,17,5,1,50,116,92
,254,2,56,24,71,197,33,0,3,17,1,
0,229,205,181,3,226,17,16,0,167,
237,82,32,240,193,16,233,62,240,
211,63,6,65,119,16,253,62,15,211
,63,6,65,116,15,253,197,205,142,
2,193,33,32,39,167,237,62,40,2,2
4,189,195,104,25
  69 DATA "10391"
 100 SAVE "TLK"CODE 64360,1000
 102 PRIN" "Machine-code now SAV
ED.""Are you sure all the DATA
are ""correct?(y/n)."""If not t
hen SAVE this ""program too!":
INPUT ;q$
 104 IF q$="y" OR q$="Y" THEN GO
 TO 9999
 900 STOP
1000 LET LINE=48: PRINT AT 4,3;
INVERSE 1;"READING DA"A ": PRINT

1001 DIM a$(10,5): DIM s(1000):
LET t=0: LET w=0: LET x=64360: F
OR m=1 TO 1000: READ s(m): POKE
x,s(m): LET t=t+s(m): LET x=x+1
1005 IF m>1 AND m=100 OR m/100=I
NT (m/100) THEN GO SUB 1050
1010 NEXT m
1030 GO TO 100
1050 LET LINE=LINE+2: LET w=w+1:
 PRINT PAPER 2;LINE,t: READ a$(w
): IF VAL a$(w)<>T THEN PRINT "E
rror in LINE " LINE: STOP
1070 LET t=0: RETURN
9000 STOP
9999 RANDOMIZE USR 54360
```

```
Listing 2
9990 REM Toolkit
9992 CLEAR 64359
9994 LUAD "TLK"CODE 64360
9996 RANDOMIZE USR 54360
```

Drums

Stephen Payne, Ipswich

AMSTRAD

THIS PROGRAM simply plays a drum rhythm. Realistic effects have been achieved by using the Env commands. ■

Amstrad Drums.

```
5 s=1
10 'drums **** S.Paine 4/11/84
15 MODE 0
20 CLS:LOCATE 8,11:PRINT"DRUMS"
30 ENT -1,1, 127,1,5,24,1
40 ENV 1,1,15,1,5,-3,2
50 ENV 2,15,-1,10
60 FOR t= 1 TO 4
65 IF s>2 THEN s=1
66 IF s=1 THEN ch=1
67 IF s=2 THEN ch=4
70 FOR y=1 TO 3
80 FOR o=0 TO 100:NEXT o
90 TOn=(t+4)*54
100 SOUND ch,ton,6,0,1,1,1
110 NEXT
120 s=s+1:NEXT:ch=5:s=1
130 FOR t=0 TO 90:NEXT
140 SOUND 2,0,150,15,2,0,1
150 FOR p= 1 TO 3
160 SOUND ch,486,6,15,1,1,2
170 FOR t=0 TO 360:NEXT
180 SOUND ch,300,6,0,1,1,2
190 FOR t=0 TO 180:NEXT
200 SOUND ch,300,6,0,1,1,2
210 FOR t=0 TO 180:NEXT
220 SOUND ch,486,6,15,1,1,2
230 FOR t=0 TO 360:NEXT
240 SOUND ch,300,6,0,1,1,2
250 IF p<3 THEN FOR t=0 TO 360:NEXT
260 IF p=3 THEN FOR t=0 TO 240:NEXT
270 NEXT p
280 GOTO 60
```

INDEX

Simon Rollins with an updated version of the YC index. The first digit after the reference refers to the volume number, the second to issue number and the third to the page on which the reference occurs.

(continued on next page)

(continued from previous page)

INDEX

(continued on next page)

(continued from previous page)

INDEX

The rest of the index will be published next month.

EXPERIENCE
STELLAR 7
FEATURING SUPERB 'BATTLEZONE' ACTION!
War! Gir Draxon, Supreme Overlord of the Arcturan Empire, has declared war on the Terran Empire, prompting Earth's leaders to dispatch the entire Terran Fleet to intercept the Arcturan Armada. With the fleet half-way to Arcturus, Terran Intelligence discovered the existence of the Warplink, a phenomenon permitting the transfer of matter from one spot to another. Gir Draxon was transporting an entire ground assault force to Titan, Saturn's largest satellite, as the prelude to a massive invasion of the now-unprotected Earth. Earth's only remaining hope is the RAVEN, an experimental armoured craft equipped with anti-grav pods, an inviso-cloak, and heavy weaponry. You must pilot the craft through the seven Warplinks from Arcturus to Titan, destroying the guardposts on the way, in order to clear a path for the return of Earth's forces. A suicide mission? Or Earth's only hope?
OUTSTANDING 3-D VECTOR GRAPHICS
for your Commodore 64
CASSETTE £9·95 DISK £12·95
U.S. GOLD
American Software
U.S. Gold is stocked by all leading computer stores including John Menzies WHSMITH WILDINGS WOOLWORTH
Dealers! For information on how to become a U.S. Gold Stockist write to:
CentreSoft, Unit 10, The Parkway Industrial Centre,
Heneage Street, Birmingham B7 4LY. Telephone: 021-359 3020. Telex: 337268.

THE WAITING IS OVER!

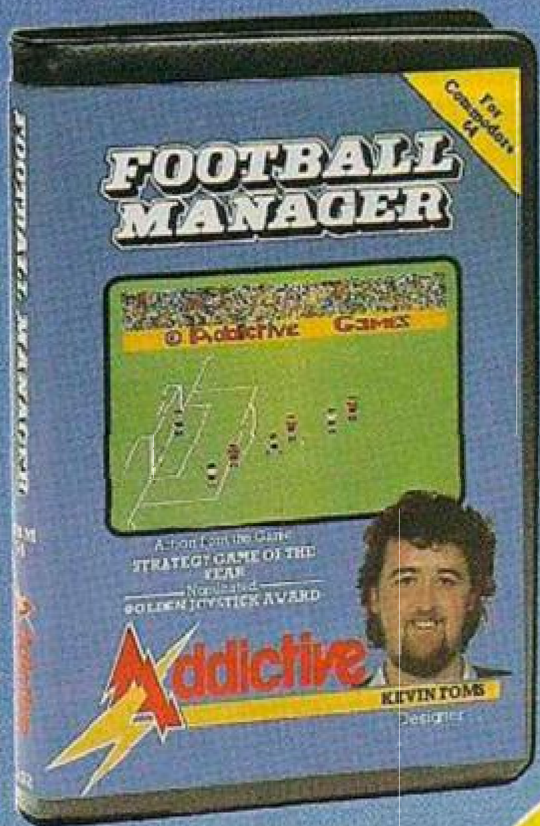
The long awaited follow-up to FOOTBALL MANAGER by KEVIN TOMS is now available

SOFTWARE STAR

Available NOW for SPECTRUM 48K £6.95 COMMODORE 64 £7.95 AMSTRAD CPC 464 £7.95

SOFTWARE STAR is the NEW game from Kevin Toms, who designed the Software Classic – FOOTBALL MANAGER. SOFTWARE STAR allows *you* to try your hand at running a successful software company. You have to cope with staff problems, game launches, advertising, financial problems and more while trying to produce chart topping successful games. One other thing, SOFTWARE STAR has that *gripping* Addictive quality that all Kevin's games have!

NOW AVAILABLE FOR YOUR COMPUTER!



FOOTBALL MANAGER

by KEVIN TOMS

"**Absorbing and realistic – Highly recommended**" – *Sunday Times, February 1984*

"**Completely fantastic – I want one!**" – *Charlie Nicholas, Arsenal striker in Big K, April 1984*

Some outstanding features of the game

- Transfer market • Promotion and relegation
- F.A. Cup matches • Injury problems • Full league tables
- Four Divisions • Pick your own team for each match
- As many seasons as you like • Managerial rating
- 7 skill levels • Save game facility • Financial manipulations
- You can even be sacked!

NEED WE SAY MORE

Addictive

FOOTBALL MANAGER is available for the following computers:–

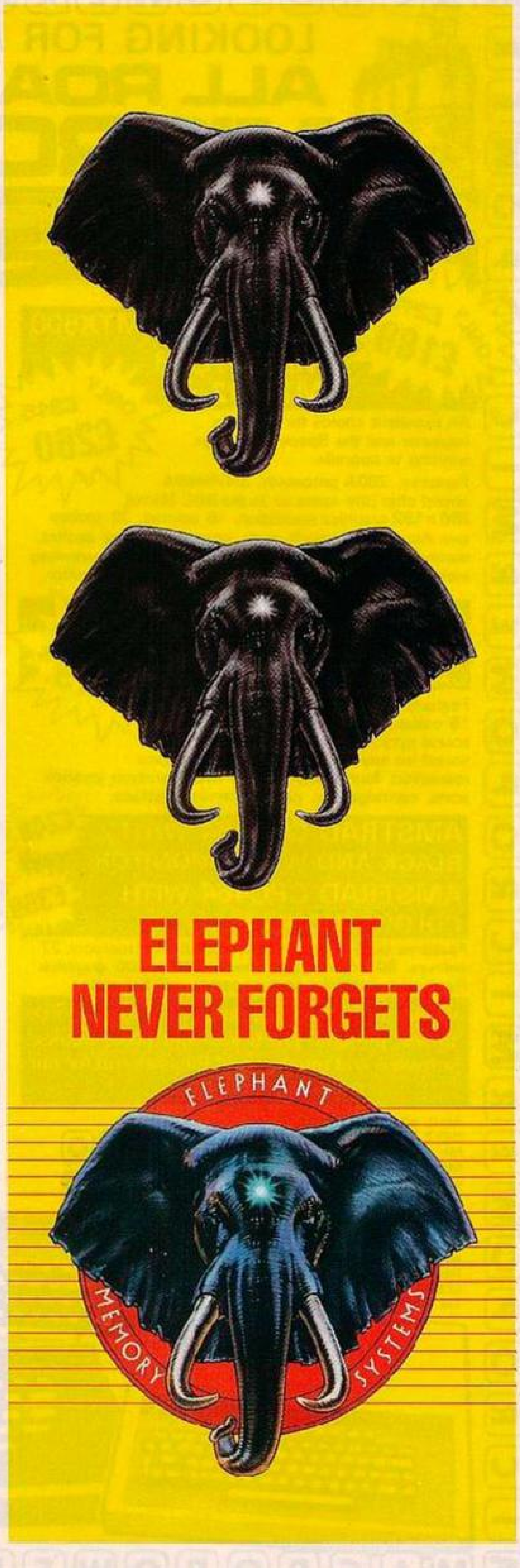
AMSTRAD CPC 464	£7.95
COMMODORE 64	£7.95
SPECTRUM 48K	£6.95
ELECTRON	£7.95
BBC MODEL B	£7.95
ORIC 48K & ATMOS	£7.95
DRAGON	£5.95
ZX81 16K	£5.95
VIC 20+16K	£5.95

(soon for MSX)

Available from Boots WHSMITH and John Menzies (selected titles)

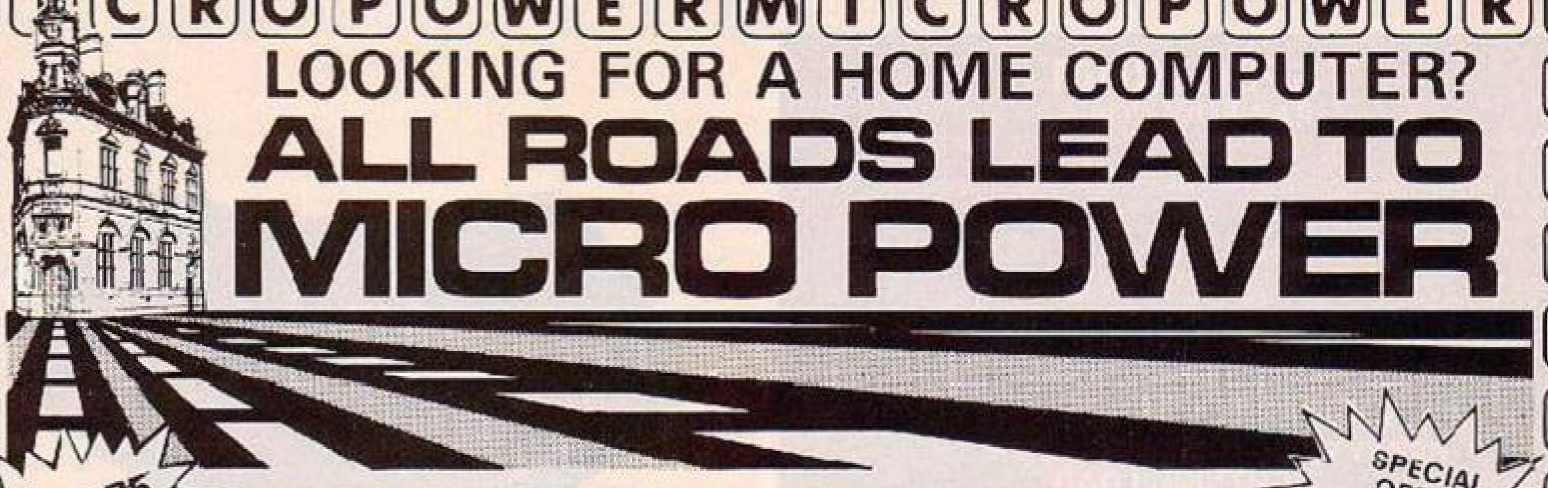
In case of difficulty buy by mail order.
Send Cheques/P.O.s to:–
ADDICTIVE GAMES
7a Richmond Hill, Bournemouth, Dorset BH2 6HE.

Multiple Combat Scenarios
Full Aerobatics
3-D Graphics
F-15 STRIKE EAGLE
U.S. GOLD
All American Software
MicroProse Software
64
ATARI
F-15 Strike Eagle features superb 3-D graphics, F-15 manoeuvreability, computer assisted targetting including modern fighter Heads Up Display, airborne radar, air to air missiles, surface to air missile defence, ground target bombing, full aerobatics, and multiple combat scenarios.
DISK/CASSETTE £14.95
Solo FLIGHT
SPITFIRE ACE
NATO COMMANDER
SOLO FLIGHT: Take off with this user friendly flight simulator which includes 3-D graphics, full cockpit instrumentation, dual VORs, ILS, 21 different airports, and real life challenges from weather and mechanical emergences. DISK/CASSETTE £14.95
SPITFIRE ACE: Save London during the Blitz in your RAF Spitfire! Outstanding out-of-the-cockpit 3-D graphics; 14 different combat senarios. DISK £12.95, CASSETTE £9.95
NATO COMMANDER: Defend Europe in an accelerated real-time war situation! Full scrolling battle map, includes infantry, armour, helicopters, airforces and tactical nuclear weapons. DISK £12.95 CASSETTE £9.95
U.S. Gold is stocked by all leading computer stores including:
Boots
John Menzies
WHSMITH WILDINGS WOOLWORTH
U.S. Gold Limited, Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY.
Telephone: 021-359 3020. Telex: 337268.



ELEPHANT
NEVER FORGETS
ELEPHANT
MEMORY
SYSTEMS

MICROPOWERMICROPOWER



LOOKING FOR A HOME COMPUTER?
ALL ROADS LEAD TO MICRO POWER

ONLY ~~£275~~ £189

MEMOTECH MTX500

MEMOTECH MTX512

ONLY ~~£315~~ £260

An excellent choice for both the beginner and the Spectrum owner wishing to upgrade.

Features: Z80A processor, SN76489A sound chip (the same as in the BBC Micro), 256 x 192 graphics resolution, 16 colours, 32 sprites two Atari-type joystick ports, composite video socket, number pad. Sophisticated utilities to aid programming include built-in Assembler/Disassembler and monitor.

COMMODORE 64 PLUS COMPATIBLE CASSETTE RECORDER

SPECIAL PRICE ~~£268.95~~ £219.95

Features: 64K, Microsoft BASIC, 16 colours, 8 multi-coloured sprites, sound synthesiser (producing the best sound on any micro), 320 x 200 graphics resolution, four function keys, two Atari-type joystick ports, cartridge slot, parallel printer interface.

AMSTRAD CPC464 WITH BLACK AND WHITE MONITOR £249

AMSTRAD CPC464 WITH COLOUR MONITOR £359

Features: built-in cassette recorder, 64K of memory, 27 colours, 80 column text mode, 640 x 200 graphics resolution, joysticks port, separate number pad.

We also stock a wide range of monitors, disk drives, printers, joysticks, light pens, books, software and much more! Please send for our complete list.

MAIL ORDER ADDRESS:
DEPT. YC1
MICRO POWER LTD.
SHEEPSCAR HOUSE
SHEEPSCAR STREET SOUTH
LEEDS LS7 1AD
Tel: (0532) 434006

SHOWROOM ADDRESS:
MICRO POWER LTD.
NORTHWOOD HOUSE
NORTH STREET
LEEDS LS7 2AA
Tel: (0532) 458800

MICRO POWER

VISA

BBC MODEL B PLUS CASSETTE RECORDER AND 5 MICRO POWER OR SELECTED ACORNSOFT TAPES

SPECIAL OFFER! £399

Features: 32K. BBC BASIC (the fastest on any home computer), 8 display modes, 16 colours, 640 x 256 high resolution graphics, 3 voice sound plus noise channel, RS423 and Centronics printer interfaces, joystick port, built-in Assembler, 10 user definable function keys. Complete with a 16 program cassette and 512 page User Guide.

ACORN ELECTRON PLUS CASSETTE RECORDER OR 5 MICRO POWER TAPES

SPECIAL OFFER! £199

The scaled down version of the BBC Micro. Features: BBC BASIC, 32K, 7 display modes (including 80 column text mode and 640 x 256 graphics resolution), 16 colours, 9 octave sound plus noise channel, built-in Assembler. Complete with an Introductory Cassette containing 16 programs, a User Guide, and a book: "Start Programming on the Electron".

SINCLAIR SPECTRUM 48K PLUS FREE 6-PACK SOFTWARE

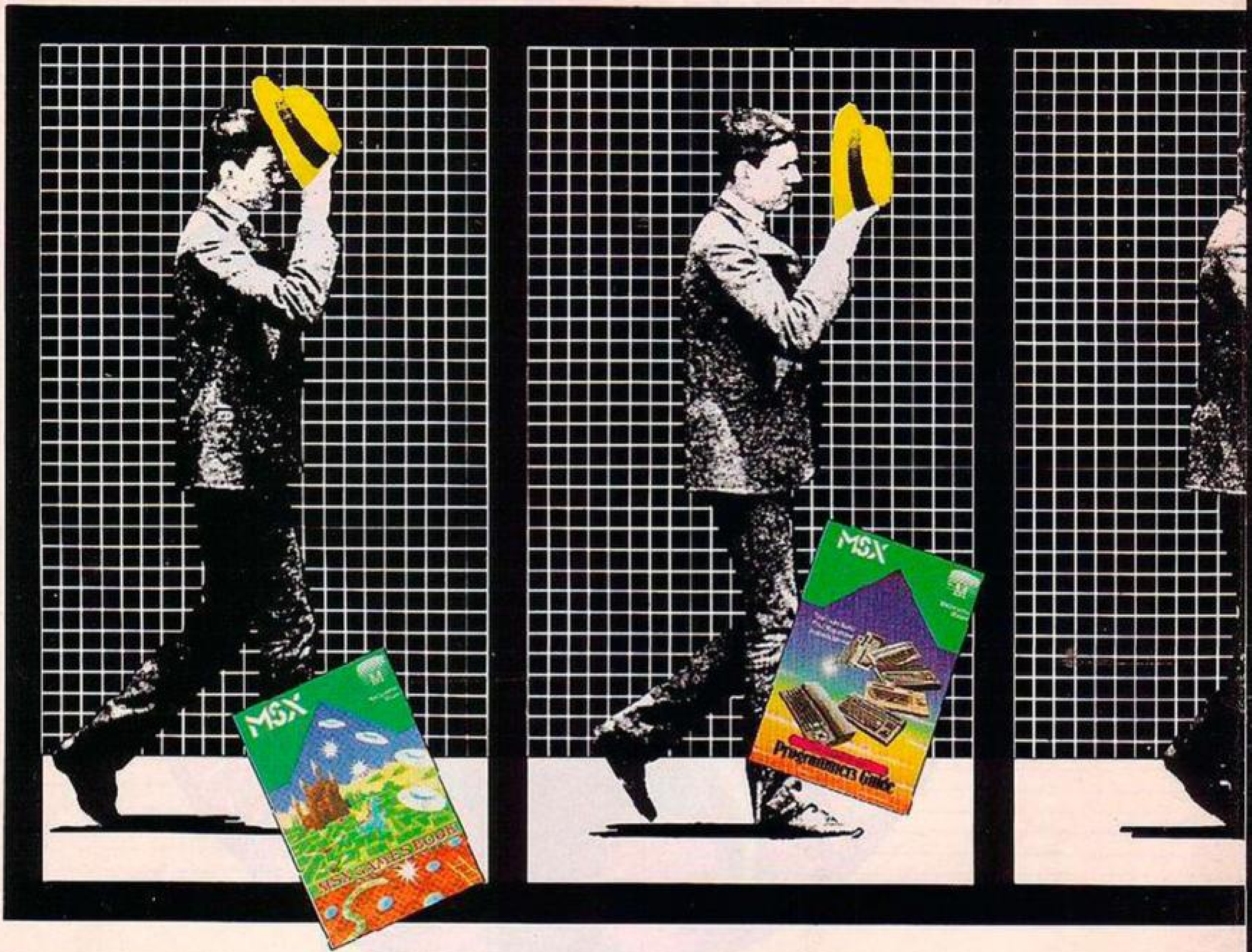
£125

PRICES CORRECT AT TIME OF GOING TO PRESS. ALL PRICES INCLUSIVE OF VAT. HIRE PURCHASE AVAILABLE. PLEASE CONTACT US FOR FURTHER DETAILS. CARRIAGE FREE FOR BBC AND MEMOTECH. ALL OTHER COMPUTERS £5.00. U.K. MAINLAND ONLY.
AMPLE FREE PARKING!

MICROPOWERMICROPOWER

Please ring for Availability

HATS OFF TO MEL



☐ Please send me your free catalogue.
Please send me:

MSX BOOKS

- ☐ MSX Games Book £6.95
- ☐ The Complete MSX Programmers Guide £14.95
- ☐ MSX Exposed £7.95

COMMODORE 64 BOOKS

- ☐ Supercharge Your Commodore 64 .... £5.95
- ☐ Commodore 64 Games Book 2 .... £6.95
- ☐ Commodore 64 Software Projects £6.95
- ☐ Commodore 64 Games Book £5.95
- ☐ Commodore 64 Sound & Graphics £5.95
- ☐ Commodore 64 Exposed £6.95
- ☐ Commodore 64 Machine Language for the Absolute Beginner £6.95

BBC BOOKS

- ☐ Guide to BBC ROMs £9.95
- ☐ Building Blocks for BBC Games £6.95
- ☐ BBC Software Projects £6.95
- ☐ BBC BASIC for Beginners £7.95
- ☐ BBC Hardware Projects £8.95

QL BOOKS

- ☐ Quick QL Machine Language £7.95

I enclose my cheque/money order for £

Please debit my Access Card No. Expiry Date

Signature

Name

Address

Postcode POP2/12

Orders to:
Melbourne House Publishers
39 Milton Trading Estate
Abingdon, Oxon OX14 4TD

Correspondence to:
Castle Yard House
Castle Yard
Richmond TW10 6TF

Trade enquiries welcome.

£

£ + p/p .80

Total

£

All prices include VAT where applicable. Please include 80p for post and pack.

Access orders can be telephoned through on our 24-hour ansafone (0235) 83 5001.

YOUR COMPUTER CLASSIFIED

01-661 3036

Contact: Lucy O'Sullivan

ADVERTISEMENT RATES — Copy Date Jan 25th

Lineage: 50p per word (Min 20 words)
Box No: £4.00 extra
Linage advertisements are prepayable and the order form published in this section should be completed and returned with remittance. Credit Card facilities are available.

Display — rates per scc (Min. 2scc)

One insertion	:	£9.00
Three insertions	:	£8.70
Six insertions	:	£8.50
Twelve insertions	:	£8.00

Display advertisers should preferably reserve space by phone.

Closing date for Classified advertisements is the 26th Nov. for the Jan. edition.

Post to
Your Computer Classified Department, Room H211. Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Britain's Biggest Selling Home Computer Magazine

The Publishers take all reasonable care to ensure that classified advertisements are genuine, but readers must satisfy themselves that they will be obtaining what they require before entering into transactions, particularly if they involve large sums of money.

SELL IT WITH YOUR COMPUTER CLASSIFIED ORDER FORM

Classified Rates

Linage: 50p per word (Min 20 words) — prepayable

Linage advertisers should complete the form provided in BLOCK CAPITALS. Phone number counts as 2 words. Name and address to be paid for if used in advertisement. Box Number if required is £4.00 extra.

Display — rates per scc (Min 2scc)

One insertion	:	£9.00
Three insertions	:	£8.70
Six insertions	:	£8.50
Twelve insertions	:	£8.00

Display advertisers should provide separate copy and preferably reserve space by phone (01-661 3036.

Method of Payment

Cheques etc, should be made payable to Business Press International Ltd, and crossed. I enclose herewith cheque/PC for

£.....................................

Please debit my Access/Visa Barclay Card/American Express/Diners Club Intl (as below

SIGNATURE

Post to:

Cut out the order form and return together with your remittance to: Classified Department, Your Computer, Room H211, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. (01) 661 3036

Please insert the following advertisement in Your Computer Classified Section

				LINAGE
				£10.00
				£12.50
				£15.00
				£17.50
				£20.00
				£22.50
				£25.00

No. of insertions required ☐ Box No. required YES/NO

NAME *(Please include initials)*.

ADDRESS ....

....

....

Payment by credit card please state address card is registered

Daytime tel. no ....

THIS FORM SHOULD BE RETURNED BY JAN 25th FOR MARCH ISSUE PUBLICATION

Company Registered Number: 151537 (England). Registered Office: Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Hot★ lines

Acorn Computers
Telephone: Cambridge 0223 210111

Atari
Telephone: Slough 0753 24561

Amstrad
Telephone: Brentwood 0277 228888

Commodore CBM
Telephone: Northampton 0500 205252

Enterprise
Telephone: 01-739 4282

Oric
Telephone: Cambridge 02205 5141

Sinclair
Telephone: Cambridge 0276 685311

Tandy Corporation
Telephone: Birmingham 021 5566101 ext 33

Toshiba
Telephone: Camberley 0276 62222

DATEBASE

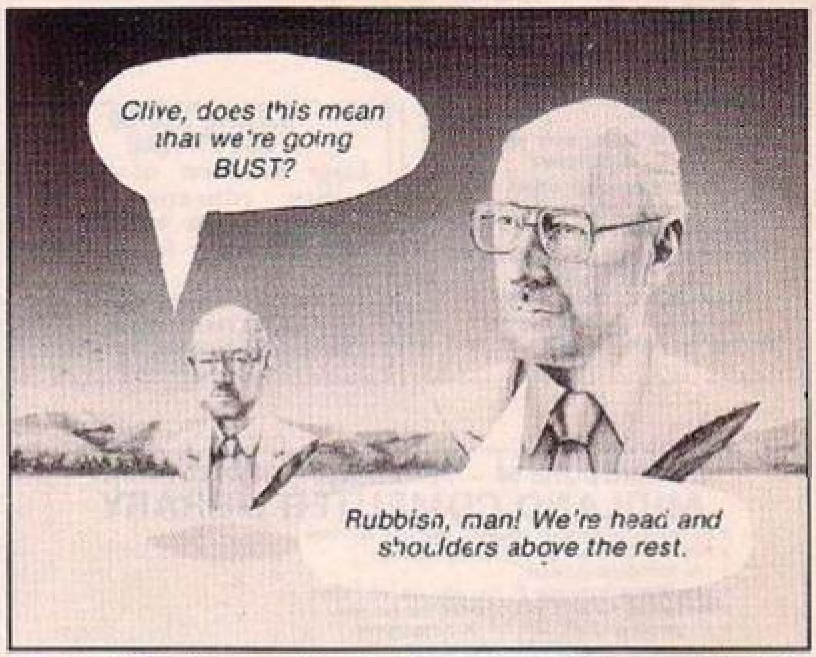
Local, national and international micro events are updated here. To publicise your event, phone Paul Bond on 01-661 3472.

LET

Short for International Trade Show for Home Computers, Software and Leisure Electronics. From February 17-19 at Olympia. Phone Rickmansworth (0923) 777000 for more information.

Microprocessor Development Show

You'll need a business card or a persuasive dad to get into this in-depth hi-tech expo. At Wembley Conference Centre from February 12-14. Details from Project Presentations Ltd. 01-242 3621.



Not Sir Clive demonstrating the parts of your body most likely to be removed by articulated lorries while driving a Sinclair C-5, but one of 'The Clives' awards designed by David Rowe and presented by Quicksilva and Bug-Byte. We won ours for the best show of 1984!

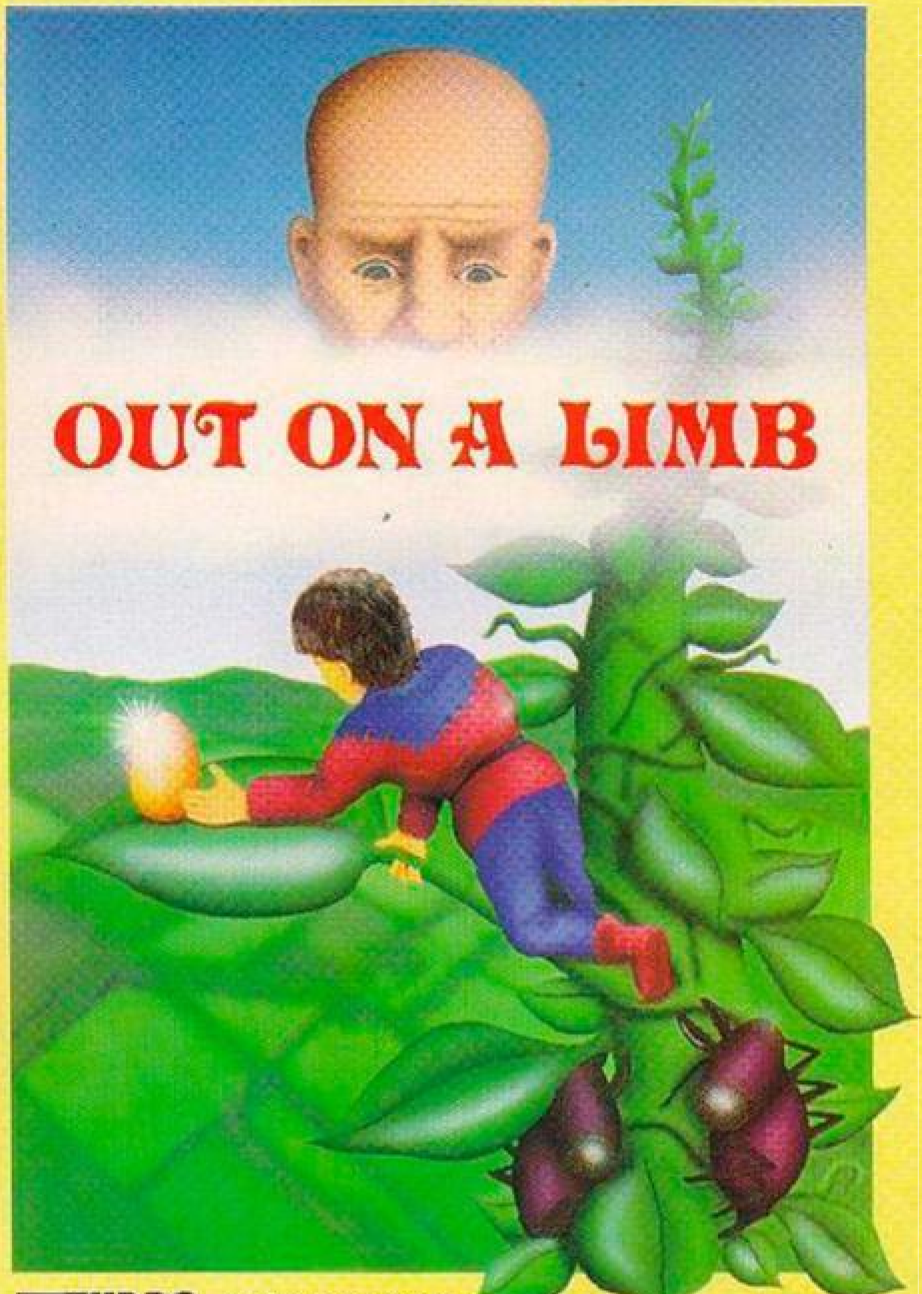
Apricot & Sirius Computer Show

From February 5-7 at Kensington & Chelsea Town Hall. A chance to get your hands on an up-market machine. Details from Paradox Group 01-241 2354

INDEX OF ADVERTISERS

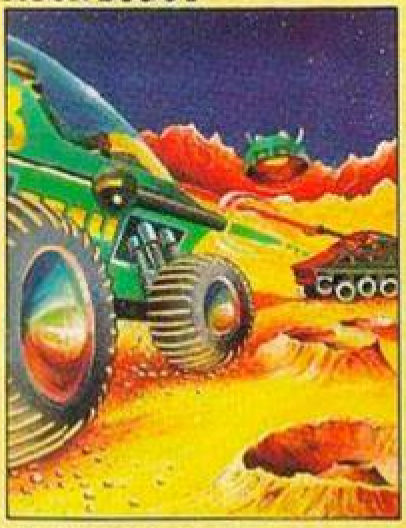
COMMODORE C16 AND PLUS 4

LAS VEGAS



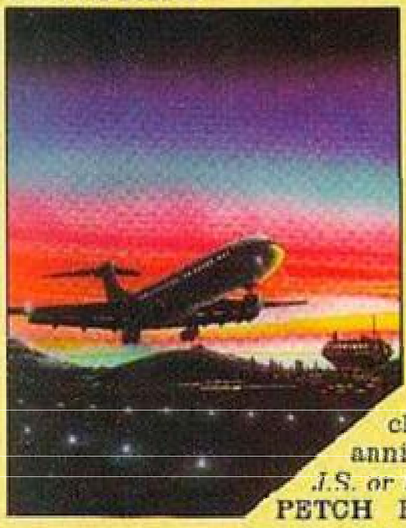
ZODIAC

MOON BUGGY



3D TIME TREK

FLIGHT PATH



SKRAMBLE

TURBO FAST LOADER

LAS VEGAS Las Vegas brings all the challenges of a deluxe arcade fruit machine direct to your fingertips. Many exciting features include, gamble, cancel, collect, nudge and number options, with a three row display and maximum payout of 20$.
K.B. Only C.16 £6.95

ZODIAC This is an enthralling arcade adventure in which the evil powers of hell have scattered the signs of the Zodiac in the four hundred chambers of the abyss. Struggle to collect these signs and at the same time try to annihilate everything in your way. How long can you stay alive?
J.S. or K.B. C.16 £6.95

PETCH Race Petch around the screen, moving ice blocks to alter the maze, however, beware of the nasty monsters who are constantly chasing Petch as you attempt to collect the bonus cherries. Also if you can touch the edge of the maze the monsters will suddenly burst into flames, but look out they'll soon be back!
J.S. or K.B. C.16 £6.95

MOON BUGGY You must skillfully manoeuvre your jumping patrol vehicle over dangerous moon craters as well as large boulders and cunningly placed mines. Not only this but avoid the hovering alien spaceship as it bombards you from above.
J.S. or K.B. C.16 £6.95

3D TIME TREK As sole survivor of the planet "Corillian" your quest is one of anger and revenge. The starship you are flying is full of the latest inboard computers and extra powerful sensors. Also included are full 3D graphics, to add unbelievable realism to this fantastic journey through time itself, and beyond.
J.S. and K.B. C.16 £6.95

SKRAMBLE Earth has been overrun by the Cobrons and its up to you to battle through the six ferocious and testing sectors. Adversaries include meteors, UFO's and deadly fireballs. Fly through an armoured city, then an elaborate maze and finally the command base itself.
J.S. or K.B. C.16 £6.95

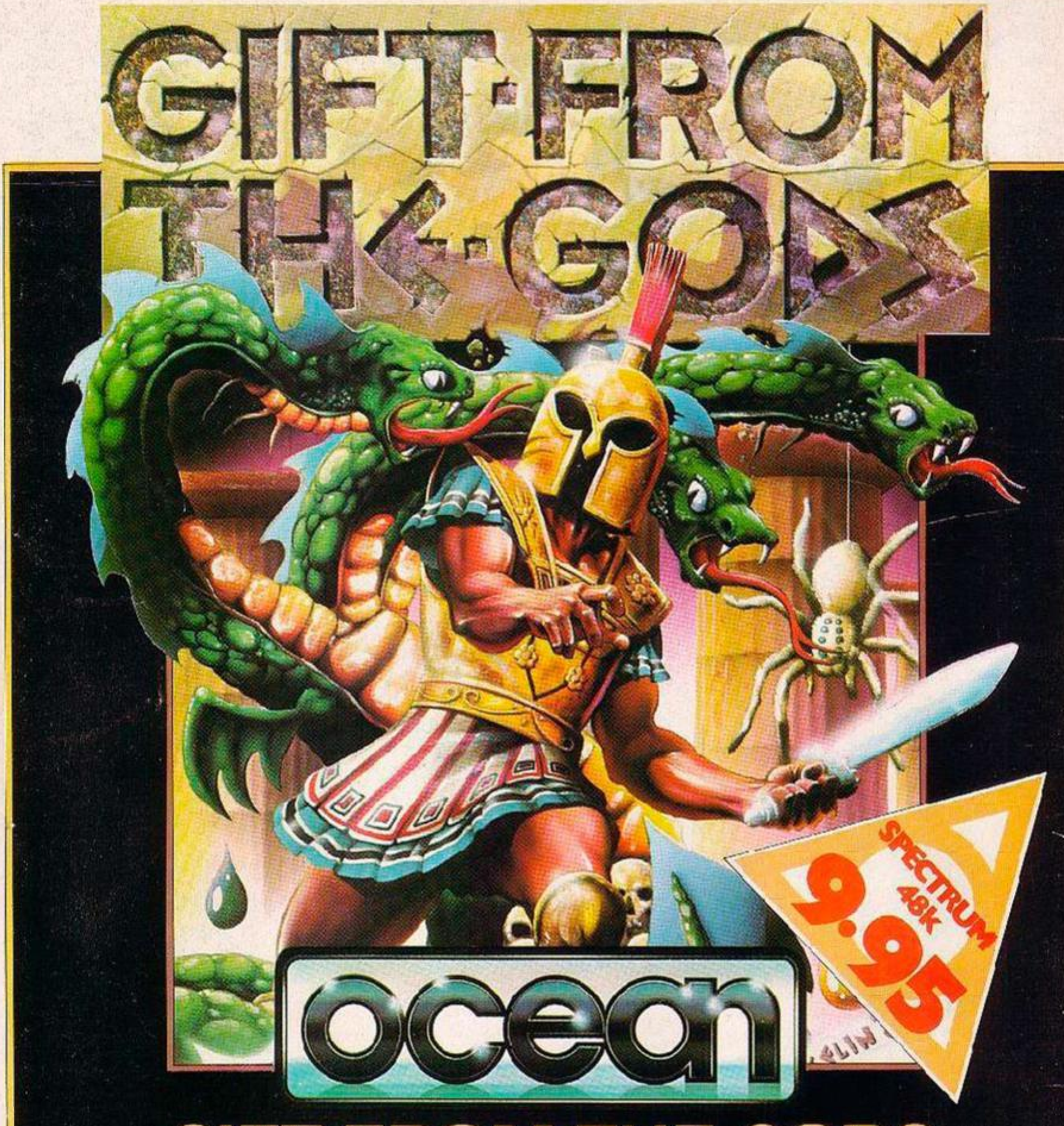
FLIGHT PATH Flight Path is without doubt the best flight simulator on the C/16 and Amstrad. The many elaborate features include; Altometer, flaps, directional headings, crosswinds, fires, ground warning lights and reverse thrust to name but a few. Also included are smooth graphics as you take off, cruise over mountains, and land once again.
J.S. and K.B. C.16 £6.95

OUT ON A LIMB This is a fantastic and in parts outrageously funny game. Based on the fairytale of Jack and the Beanstalk, Out On A Limb is full of the most strange and eccentric characters you are ever likely to meet. Firstly, climb the stalk and jump onto the clouds, then enter the giant's castle searching for treasures. However, watch out for vacuum cleaners, musical notes, televisions and potted plants, all of which chase you round the many and elaborate rooms of the castle. Once the treasure is collected the single exit will be opened, and then..........?
J.S. or K.B. C.16 £6.95

ANIROG

Mail Order: 8 HIGH STREET HORLEY SURREY 24 HOUR CREDIT SALES HORLEY 02934 6083 Payment by: P.O. - ACCESS - VISA

AVAILABLE FROM YOUR COMPUTER STORE



GIFT FROM THE GODS

"The Power of Destiny"

- Number 1 Blockbuster from the "**MEGA TEAM**".
- Spectacular arcade – adventure played in a multitude of ways and at many different levels.
- Watch the Secrets of the Labyrinth unfold as our Hero, ORESTES, tests his skill against the power of GOD and MAN.
- Stunning animated graphics take you beyond time . . . into the "**FIFTH DIMENSION**".
- "**INTELLIGENT**" controls allow ORESTES to perform an astonishing repertoire of feats from the command of joystick or keyboard.
- Discover the key to "**AGAMEMNON'S** puzzle, through the power of Intrigue and Illusion!

Ocean Software is availabe from selected branches of: **WOOLWORTH**, WHSMITH, Boots, John Menzies, LASKYS, Rumbelows, **COMET**, Spectrum Shops and all good software dealers. Trade enquiries welcome.